ASSESSING READING-RELATED SKILLS IN ARABIC-SPEAKING CHILDREN

By

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To My Father

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A large body of research in the area of reading instruction has stressed the importance of pre-literacy skills and their role in learning to read Young children must possess a certain number of skills before they can begin to read Such skills include letter knowledge, concept of word, invented spelling phonological awareness and speeded naming. These skills, in addition to other phonologically-based skills (e g. speech sequencing production and phonetic recoding in short term memory), have been found to be predictive of later reading achievement Thus assessing such reading and pre-reading skills prior to formal reading instruction is useful for identifying children who may be at risk for reading failure

The purpose of this study was to collect a regional normative database for Arabic-speaking children. The subjects included 150 Arabic-speaking children with an equal number of boys and girls between the ages of 7.0-7.6 years. The subjects were selected from three different types of communities in the West Bank: city of Nablus, city, village and a United Nations refugee camp. The subjects in this study were administered individually a number of reading and reading related measures that have been found to correlate highly with reading. These measures include an adapted version of the Early Reading and Screening Instrument (ERSI), four phonological awareness tasks (PA), three oral language measures (speech production, rapid serial naming and verbal fluency), and one visual-perceptual measure. This study was designed because no formal Arabic test exists that assesses reading readiness.

Results of this study revealed strong correlations between the total ERSI scores and PA scores. Moderate significant correlations were found between the scores of all ERSI subtests and the two tests of naming (rapid serial naming and verbal fluency) and between most PA subtests and the rapid serial naming and verbal fluency. No significant difference was found between male and female subjects' scores across all measures. However, significant differences were found between the performance of subjects from the city and those from the village on the total ERSI and total PA tests.

CHAPTER I
INTRODUCTION AND REVIEW OF THE LITERATURE

Introduction

Approximately 20% of English speaking children in the United States experience difficulty in learning to read (Stedman and Kaestle, 1987 Shaywitz, 1996) Many of these children persist in having reading problems even with continuous instruction Reading disability is a broad term and includes different types of reading deficits The most central issue in the area of reading instruction appears to be the early identification of children at risk for reading failure prior to the onset of formal reading instruction. In order to identify reading-disabled children, specialists/teachers need appropriate measures to assess reading and prereading skills The areas that have been found to be most predictive of later reading ability are letter knowledge, invented spelling, phonological awareness, and speeded naming (Adams, 1990, Brady, Fowler, Stone, and Winbury, 1986 Goswami and Bryant, 1990, Lombardino, Morris, Mercado, DeFillipo, Sarisky, and Montgomery, 1996, Torgesen, Wagner, and Rashotte, 1994 Wagner and Torgesen, 1987, Wagner, Torgesen, and Rashotte, 1994, Wolf, 1984 Wolf, 1991) In particular tasks of phonological awareness as well as speeded naming have been used most frequently in the reading literature to detect children with reading disability, and deficits in one or both of these areas have been found to correlate highly with reading disability Other phonologically-

based skills such as phonetic recoding in short term memory and speech sequencing production, have also been shown to be predictive of later reading achievement (Brady and Shankweiler 1991, Catts, 1989; Liberman, Mann, Shankweiler, and Werfelman, 1982 Vellutino Scanlon, and Spearing, 1995)

Alphabet knowledge, phonological awareness, and speeded naming are the skills that research has shown to be most predictive of later reading abilities. Adams (1990) Brady et al (1986) and Lombardino et al (1996) have all stressed the importance of certain prelsteracy skills and their role in reading readiness. Letter knowledge, concept of word, and invented spelling have been found to be significant predictors of later reading achievement. Adams pointed that invented spelling is essentially a process of phonics She noted that children s interest in how words are spelled promotes understanding of the alphabetic system, which in turn enhances children's linguistic readiness for reading. In fact, Brady et al noted that the phonetic appropriateness of spelling provides a general window into the child s level of phonological awareness

Further Goswami and Bryant have addressed the importance of phonological awareness and its crucial role in developing reading skills. Phonological awareness occurs at the syllabic, intrasyllabic, and phonemic levels in an ordered manner. As children grow, they gradually begin to recognize that speech is made up of words words are made up of syllables, and syllables are made up of individual sounds. Examples of phonological awareness are recognizing rhyme or alliteration, breaking a word into syllables or phonemes, and blending sounds to form a word. In fact, phonological awareness skills prior to beginning reading in first grade are excellent predictors of later reading success

Phonological recoding in lexical access (speeded naming) also has been found to correlate strongly with later reading achievement. This skill taps the ability to retrieve phonological codes from long-term memory. A deficit in this area has been shown to occur frequently in children with reading disabilities (Denckla and Rudel, 1976; Wolf 1984, and 1991). Speeded naming places a demand on some cognitive subprocesses that are necessary for word recognition (e.g., attention and articulation). Further, difficulty in sequencing speech sounds in multisyllabic words resulting in hesitations and fluency disruptions has been documented in the oral reading of adults with reading disabilities (Catts, 1989).

The purpose of this study is to collect a regional normative database for Arabic-speaking children's performance on reading and reading related tasks shown to be strongly correlated with reading ability. A need for this research stems from the fact that no formal Arabic test exist that assesses reading readiness across a range of prelitaracy skills known to predict which children are at risk for reading failure.

Review of the Literature

The following section addresses theories of reading, developmental models of reading acquisition, methods of teaching reading, literacy preparation, phonological processing, the effects of training phonological awareness on reading, characteristics of reading disabilities, and deficits in phonological processing in children with reading disabilities.

Theories of Reading, Models of Acquisition, and Methods of Teaching Reading

Theories of the Process of Reading

The research on beginning readers carried out by several authors shows high a correlation between the ability to identify printed words and the ability to read text (Ehri 1980 Firth 1972) However there is controversy about which skills contribute most to the process of reading words accurately and rapidly Three types of word learning processes have been suggested, letter sound mapping skills (Liberman and Shankweiler 1985) rapid and automatic recognition of printed words (Perfetti and Hogaboam, 1975, Perfetti and Lesgold, 1979), and recognition of the meanings of printed words embedded in larger sentence and text contexts (Goodman, 1970, Smith, 1973)

According to the *dual route theory* readers can read words using one of two routes the lexical route or the phonological route (Baron, 1977, Barron, 1981 1986, Baron & Treiman 1980) Words are read via the visual lexical route by making associations between the visual form of the word stored in memory and its meaning No systematic recoding rules are involved in this lexical route Such associations are learned by rote memory through repetition and practice Using the phonological route involves systematic application of letter-sound rules to derive a word s pronunciation This pronunciation is then used to retrieve the meaning of the word from lexical memory Phonological recoding is used mainly to read unfamiliar words difficult words, and nonsense words On the other hand words that receive sufficient exposure enter the memory and are read by sight The two routes are proposed to operate independantly at the level of word reading. The visual route is considered faster than the phonological route because the

reader processes the word as a whole unit to access meaning rather than processing each letter in a word in its right order to derive its pronunciation and then to access its meaning

Another variation of the dual route theory is Baron's (1977) path model of reading In this model word reading is accomplished through linkages between print sound and meaning codes Paths between print and sound and print and meaning are used in the reading process alone while paths between sound and meaning are used in both speech and reading Baron distinguished between two types of paths from print to sound a *word-specific* path and a *rule* path The word-specific path links whole printed words to whole spoken words. This path is used mainly when exception words are read because rules alone are insufficient for complete decoding The rule path links parts of printed words (letters) to parts of spoken words (phonemes) This path is used primarily when rule-governed correspondences exist between spellings and sounds (e g , reading regular words and nonsense words) in unfamiliar words

Baron and Treiman (1980) addressed the question of which mechanism, the rule path or the word specific path, children use when they read To answer that question they referred to an earlier work of Baron (1977) in which he examined groups of first through fourth grade children during their oral reading of regular words, exception words, and nonsense words The results revealed that children who relied on the word-specific paths were able to read many of the exception words and few of the nonsense words, while children who relied more on the rule path were able to read both the nonsense words and regular words The rule-path group tended to make sound-preserving errors on the exception words (i e. errors where the exception words were read according to the rules)

Baron and Treiman (1980) confirmed these findings in a more extensive study of word-path and rule-path strategies with 13 first graders, 30 second graders 12 third graders and 17 fourth graders. All subjects were tested on their oral reading of three word types, exception words, regular words, and nonsense words. A segmental analysis task was given which required the child to judge whether every two syllables spoken by the examiner ended with the same sound or not. They found that the three word types tap different abilities. The exception words were influenced more by use of word specific associations whereas the nonsense words were influenced more by use of rules. The regular words appeared to be influenced by both rules as well as word specific associations. Low correlations were found between the accuracy of reading nonsense words and exception words suggesting a dissociation between the use of rules and the use of word-specific associations. The segmental analysis correlated more highly with nonsense words than with exception words, suggesting a strong relation between the use of rules in reading and the segmenting analysis. The authors concluded that childrens' use of rules and word-specific associations are dependent on the type of stimuli being read.

Reading words in English occurs at the lexical level. The lexicon is usually defined as a store of word units having different identities. Every word has a phonological identity, a syntactic identity, a semantic identity, and an orthographic identity (a visual form of the word in one's memory). In an attempt to explain printed word learning, Ehri (1980) proposed the *word identity amalgamation theory*. She defined the term *amalgamation* as "processes by which the orthographic identity merges with the word's other identities to form a single unit in lexical memory" (p. 156). The orthographic image

of a word becomes stored in the child's lexical memory based on systematic (rather than rote) relations between the letter symbols and their already existing articulatory segments (speech) This systematic knowledge includes information about single letter-sound relations, syllabic letter-sound structure complex spelling patterns, and common spelling patterns shared by several words A prerequisite for this knowledge to occur is preparing the reader in analytic skills such as familiarity with letter shapes, names and sounds The more prepared a child is in these analytic skills the more automatically the child will be able to process visual-sound patterns According to Ehri (1980) amalgamation of all word identities occurs as the child practices pronouncing and interpreting printed words while reading them in meaningful text The visual images acquired through reading experiences are stored in memory and serve to guide spelling as well as word recognition However, Ehri (1980) proposed an interesting question How could some good readers be poor spellers? She attempted to answer this question in light of her amalgamation theory, suggesting that poor spellers have less complete knowledge of orthography in their speech mapping system than good spellers She also suggested that with reading, unlike spelling, complete orthographic images are not necessary because syntactic and semantic identities contribute information that facilitates the comprehension of text Furthermore, Ehri (1980) added that poor spellers pay less attention to specific spelling patterns (e g silent letters) as they store orthographic images in memory Good spellers seem to store these patterns by creating phonological segments for them Ehri states that "All word learning is mediated through sound initially when letters are being amalgamated to the word's phonological structure Once orthographic images are established as word symbols

in lexical memory, this mediational function ceases, and images replace sound as the means of identifying a word from its printed form" (p. 169). This may account for the difficulty a congenitally deaf person has in learning to read with ease.

In her continuing attempt to address noted weakness in the dual route theory, Ehri (1992) expanded on her amalgamation theory and proposed an alternative explanation of word reading called the *visual-phonological route*. She acknowledged that memory is involved in the process of sight word reading; however, she questioned the idea that the memory process is a rote one. Rote memory is used in learning relationships that are arbitrary, yet few English spellings are totally arbitrary in the sense that they are devoid of letter sound spelling conventions. Ehri (1992) offered an alternative conceptualization to the visual semantic route of the dual route theory, a visual route that is paved with phonological information (visual-phonological route) leading into lexical memory. She believes that the "critical connections that enable readers to find words in lexical memory by means of this visual-phonological route are connections linking spellings to pronunciations rather than to meanings" (p. 115). These connections are formed in memory by the use of letter-sound correspondences from prior experiences with reading words. Thus, Ehri's visual-phonological route is more stable in memory because it is based on many systematic (not arbitrary) connections, unlike the visual-semantic route of the dual route theory which has very few arbitrary connections.

Seidenberg and McClelland (1989) developed a comprehensive interactive lexical processing model to explain the nature of the reading system and its related parts. This model, often called a *distributed, developmental model of word recognition and naming*,

consists of four processors orthographic phonological semantic, and context Reading is seen as having an orthographic input and a phonological output The orthographic processor is activated when a word is seen It is responsible for recognizing the order of letters within the word The phonological processor then maps the letters (graphemes) onto their spoken sounds (phonemes) The meaning processor is responsible for sets of primitive word meanings. Finally, the context processor continuously refines the primitive word meanings in relation to the context until the word is understood within the text.

All four processors work together receiving and sending information to and from each other Each processor has interconnected sets of units For example, the pronunciation of a word corresponds to interconnected sets of elementary speech sounds The more familiar a reader is with a word, the stronger the interconnected units of that word will be in the reader's memory which in turn makes the word's interpretation faster

According to Seidenberg and McClelland the four processors involve *computing* the appropriate orthographic and phonological codes in reading rather than "accessing" entries in a mental dictionary Unlike other models, this interactive system has no pronunciation rules and no lexicon in which pronunciations of irregular words are stored However, this model supports both "rule-governed" and "irregular" words because it has enough units and connections to simultaneously encode both regular and irregular pronunciations of a spelling pattern

Developmental Models of Acquisition (Reading and Spelling)

Developmental models of reading and spelling acquisition generally have been conceptualized as sequences of stages These models have practical significance in

identifying the developmental stages at which a child functions Although many models have been used to explain the reading process, this discussion will be confined to discussing only three models of reading acquisition Models of reading acquisition developed by Frith (1985), Chall (1983) and Ehri (1991) are all stage-based models and share several characteristics Each stage is qualitatively different from the stage that precedes and follows it The existence of distinct stages denotes that the reader accomplishes different skills at each stage and the ordinal arrangement of stages suggests that the reader progresses through each stage in the process of learning to read

Frith's (1985) acquisition model accounts for the development of both reading and spelling (Table 1-1) She posited that children proceed through three stages before becoming proficient readers Each of these stages is characterized by greater speed and accuracy The acquisition of these three stages differs for reading and spelling because specific reading and spelling skills do not develop simultaneously For example the alphabetic stage emerges for spelling before it does for reading, and the orthographic stage in reading precedes spelling The emergence of each stage facilitates the emergence of the next stage and allows the novice reader to discover new strategies to learn to read

Snowling (1993) noted that a prerequisite for transition into Frith's (1985) alphabetic stage is the development of phonological awareness (the ability to manipulate sounds) Such skill provides insight into the alphabetic principle Snowling observed that dyslexic children experience difficulties in acquiring the alphabetic principle and often fail to internalize grapheme-phoneme correspondences with adequate automaticity because of the various phonological difficulties they experience According to Frith, children with

Table 1-1 Frith s Model of Reading and Spelling Acquisition

Stage	Description
Logographic	Remembering words by features such as first letter or word length (graphic cues) whole word recognition of 20 words or less
Alphabetic	Increasing awareness of grapheme-phoneme correspondences
Orthographic	Instantly recognizing regular and irregular words visually automatic word recognition

developmental dyslexia often use a logographic approach to reading Snowling (1993) suggests that arrested development at the logographic stage inhibits the acquisition of fluent phonic recoding and has an even greater effect on spelling than on reading Chall (1983) viewed the acquisition of both spelling and reading as a gradual progression consisting of six stages as illustrated in Table 1-2

Ehri (1991) modified Chall s model and presented four stages for reading and spelling respectively (Table 1-3) She suggested that children learn to read gradually starting in preschool and progressing to reading print independently and fluently In the early stages, children come to learn that phonemes correspond to letters Later they read with more speed allowing them to coordinate reading with comprehension In learning to spell, children move from a lower level of spelling where they represent only a few salient

letters to the highest level where they master grapheme-phoneme correspondences and spelling patterns (i e "ment tion")

Table 1-2 Chall s Model of Reading Acquisition

Stage	Age	Description
Stage 0 Prereading	Birth to 5 or 6 years	Accumulating knowledge about print and books from the surrounding literate environment
Stage 1 Initial Reading (Decoding)	5 to 7 years	Learning the associations between graphemes and phonemes
Stage 2 Unglung from Print	7 to 9 years	Detaching from print, overcoming reliance on letter to-sound correspondences, developing a sight vocabulary
Stage 3 Reading to Learn	9 to 14 years	Developing automatic word recognition, allowing the reader to focus on comprehension
Stage 4 Multiple Viewpoints	14 to 18 years	Learning to deal with more than one point of view
Stage 5 Construction and Reconstruction	18 years and after	Gaining knowledge as a result of advanced reasoning skills

Table 1-3 Ehri's Model of Reading and Spelling Acquisition

Stage	Description
	Reading
Stage 0 Prereading or Emergent Reading	
Stage 1 Initial Reading or Decoding	Detecting and segmenting phonemes in words
Stage 2 Fluency	Reading with greater speed and less effort, allowing them to coordinate reading with comprehension
Stage 3 Reading to Learn	Rapid increase in vocabulary while learning new subjects requiring reading
	Spelling
Stage 0 Prephonetic Stage	Scribbling and stringing letters and numbers together without apparent knowledge of their sounds.
Semiphonetic Stage	Realizing the relationship between sounds and letters, representing the first and last sounds of words
Stage 1 Phonetic Stage	Learning to spell phonetically using one letter for every sound
Stage 2 Within-Word Pattern Stage	Mastering grapheme-phoneme relationships learning spelling patterns that recur across words

Ehri (1992) revised her previous stage model of reading acquisition to correspond to her visual phonological hypothesis of word reading (Table 1-4). In the first stage, **visual cue (logographic) reading,** children read words by rote by memorizing connections between meanings and salient visual cues in or around words. For example the Golden Arches might be their cue for the word McDonald's. During the second stage, **phonetic cue reading,** children use their rudimentary knowledge about the letter-sound system to form partial connections between spellings and pronunciations. In the final stage, **cipher sight word reading,** children form complete connections between phonemes and their corresponding graphemes because of the phonemic segmentation and phonological recoding skills they have developed. Cipher readers are able to read similarly spelled words quickly. This skill distinguishes them from phonetic cue readers who sound out every letter they see in a word. Cipher readers also remember letter sequences in words better than phonetic cue readers who depend entirely on the letters' phonetic equivalents.

Table 1-4 Ehri's (1992) Updated Stage Model of Reading Acquisition.

Stages	Description
Visual Cue Reading	Reading by rote memory using visual cues in or around the words
Phonetic Cue Reading	Forming partial connection between spellings and pronunciation
Cipher Sight Word Reading	Forming complete connections because of phonemic segmentation and phonological recoding skills

In summary, the models of reading acquisition described by Frith (1985) and Chall (1983) postulate that there are two routes (dual route theory) used by readers, a spelling-to-sound translation route and a lexical route. When a word is read, it is either accessed directly from the stored lexicon or formulated by means of spelling-to-sound correspondences. This dual route theory accounts for sight word reading via the visual-semantic route, eliminating the need to access phonological processes. The dual route theory also suggests that rote memory underlies the learning of sight words. Ehri (1992), on the other hand, proposed a visual-phonological route with many systematic connections formed between spellings and pronunciations. She posits that experiences in recoding words lead to the formation of systematic connections linking spelling units seen to print to pronunciations stored in memory.

Methods of Teaching Reading

Several studies have estimated the number of children with reading disabilities to be 20% to 25% of the school age population (Stedman and Kaestle, 1987 cited in Liberman and Liberman, 1992). Although these numbers indicate that a serious problem exists in educating children, there has been much controversy about the best route to its solution. In fact, the concept of how to teach reading optimally has been the most politicized topic in education. Over the past three decades, two major approaches to teaching reading are at the core of this controversy. These approaches are referred to as *code emphasis* (phonics) and *whole language*.

Rigorous debate has ensued regarding which instructional approach is the most effective in teaching reading. Chall (1967) evaluated the existing instructional methods for

beginning reading in a controversial book *Learning to Read The Great Debate* She concluded that a phonics approach has strong and positive affects on learning to read In fact, this debate continues in spite a plethora of data to support phonics-based reading instruction. The debate over how to best teach reading was recently re-visited by Adams (1990) in a book entitled *Beginning To Read Thinking and Learning About Print* She pointed out that the ability to sound words out is the most critical and vital factor influencing fluent reading and comprehension A description of the code emphasis and whole language methods of teaching reading follows

Code emphasis or phonics instruction is defined as "a system of teaching reading that builds upon the alphabetic principle, a system of which a central component is the teaching of correspondences between letters or groups of letters and their pronunciations" (Adams, 1990) (p 12) The major premise of phonics instruction is that learning to read and learning to speak are related but different processes Reading takes place only if explicit tuition of the alphabetic principle is internalized. In fact, teaching the letter-to-sound correspondences is a major strength of the code emphasis approach. Proponents of code emphasis advocate systematic decoding instruction through various strategies such as blending, segmenting, rhyming in addition to presenting these skills in text

Adams (1990) noted that some children have a solid preparation in literacy upon entering first grade and need to extend what they already know and learn to enjoy reading In the case of the high readiness readers phonics instruction should be secondary to their connected text reading A major potential weakness of code emphasis is in the way that it is often used in the classroom. Some teachers emphasize seat worksheets without

explaining to students the goal behind the worksheets and the significance of letter-sound relationships. Adams also added that another instructional reality about phonics is that low readiness children get less time to read and, therefore, lag behind in their reading achievements. While many empirical studies support the use of the code emphasis method over whole language (Adams, 1990), a balanced approach to instruction (phonics and reading of interesting text) seems to have the optimal combination of features to teach reading.

Whole language advocates contend that code emphasis instruction produces children who decode but do not comprehend. However, Liberman and Liberman (1992) argued that code emphasis instruction does not advocate the meaningless sounding-out drills without relating these drills to children's experiences, and Chall (1996) at the recent 47th annual Meeting of the Orton Dyslexia Society, noted that she knows of no phonics-based approach that excludes text reading.

The philosophy of whole language is grounded in the use of literature in the context of functional experiences where children read from whole to part and from familiar to unfamiliar. Its major premise is that children learn to read naturally in the same manner that they learn oral language (Goodman, 1970; Smith, 1971; Smith, 1992). Advocates of whole language believe that because children learn to speak by being in a language environment and by listening to people, they can learn to read and write in the same way, simply by being exposed to meaningful reading and writing environments. Whole language advocates often do not employ phonic instruction (breaking the language into words, syllables, and isolated sounds). They reason that reading should be taught

from whole to part without breaking the whole (natural) language into abstract pieces. Reading and writing should be taught together in a cooperative language environment with no systematic instruction. The focus of learning is on the meaning and use of language rather than on decoding. Those who stress this approach do not see a need for systematic instruction in letter-sound correspondences because they assume that children naturally learn the necessary decoding skills (learning by doing) or receive informal (not systematic) help from the teacher when needed. In fact, Smith (1973) claimed that decoding skills are used only by beginning readers and even then, they use decoding skills to a very limited extent.

One of the major flaws of the whole language approach is that it disregards the fact that learning to read and learning to speak are not acquired in the same manner. Liberman and Liberman (1992) argued that speech is managed by a biological mechanism that provides the child with automatic production of language while reading and writing are not biological evolutions. Both reading and writing skills require explicit teaching. Reading is a cultural advance, rather than a biological one, that has come into existence only in the past 3,000 to 4,000 years. The underlying conditions of learning to read and learning to speak are different. To be able to speak requires two conditions, the child needs to be neurologically normal and needs to have adequate exposure to a mother tongue. To read, on the other hand, requires knowledge of the alphabetic principle, phonological awareness, and an intact verbal memory (Liberman and Liberman, 1992). Another weakness is that whole language disregards the necessity of the alphabetic principle, claiming that its teaching will only produce children that decode but do not

comprehend adequately No data exist to support this claim Liberman and Liberman (1992) also questioned the future of the 20 to 25% of children who do not discover the alphabetic principle on their own. Thompson (1992) underscored that reading is composed of many subskills that must be taught systematically and not left to be picked up incidentally by children. Similarly, Foorman (1995) stated that "what is implicit for some children needs to be made explicit for many others " (p 388) and warned teachers against allowing children to accumulate failures in the primary grades because they lack explicit knowledge of the alphabetic code

Literacy Preparation

Chall (1967) reported that knowledge of letter names was a strong predictor of later reading success Adams (1990) confirmed the importance of letter knowledge in learning to read while suggesting that knowledge of letters alone is insufficient for predicting later reading success She argues that it is the speed, in addition to the accuracy, with which children name letters that strongly predicts reading achievement among beginning readers.

According to Kieeck and Schuele (1996) literacy socialization includes literacy artifacts, literacy events, and literacy knowledge Literacy artifacts are items children have around them in a literate environment such as alphabet blocks books on shelves and refrigerator art Story reading, going to the library and reading menus are all examples of literacy events and activities Literacy knowledge is about showing a child how to hold a book, where to start and how and when to turn the page

The first five years are very important in the child's acquisition of literacy knowledge. Children who begin school with literacy knowledge have a considerable advantage in learning to read over children who come from literacy-deprived environments (Adams, 1990; Kamhi and Catts, 1989; and Teale 1986). The degree of exposure to literacy experiences a child encounters at home determines to a large extent his/her literacy preparedness prior to entering school. Most teachers expect that children have had some exposure to print and possess some familiarity with the phonemic significance of letters prior to starting school. Concepts about print such as knowing that words in print are represented by sounds, and that short words are represented by short letter strings are typically developed in homes that encourage literacy. In general, children seem to benefit and learn a great deal from supportive interactions with a literate environment (Adams, 1990).

Phonological Processing as the Foundation for Learning to Read

Previous research had established that individual differences in phonological processes are predictive of later differences in reading skills. Bradley and Bryant (1985), Denckla and Rudel (1976), Felton and Wood (1989), Shankweiler and Liberman (1989), Stanovich (1991), Wagner and Torgesen (1987), and Wolf (1991) have shown that a deficit in some aspect of phonological processing contributes to a disability of reading. Wagner and Torgesen (1987) defined phonological processing as "the use of phonological information (i.e., the sounds of one's language) in processing written and oral language" (p. 192). More recently, Torgesen, Wagner, and Rashotte (1994) defined phonological processing as "an individual's mental operations that make use of the phonological or

sound structure of oral language when he or she is learning how to decode written language" (p. 276). Torgesen et al. defined three major types of phonological processes phonological awareness, phonetic recoding in working memory, and phonological recoding in lexical access.

Phonological awareness refers to the awareness of and access to the phonology of a particular language. Torgesen et al. (1994) defined it as "one's sensitivity to, or explicit awareness of the phonological structure of the words in one's language" (p. 276). Strong correlations have been found between performance on phonological awareness tasks and later reading achievement (Bradley and Bryant, 1985; Felton and Wood, 1989; Liberman, Shankweiler, and Liberman, 1989). Tasks commonly used to assess this skill include tapping out the number of sounds in a word, reversing the order of sounds in a word, and putting together sounds presented in isolation to form a word. Such tasks require children to identify, isolate or blend the individual phonemes in words. There is a developmental hierarchy in the rate of acquisition of the different types of phonological awareness tasks.

Goswami and Bryant (1990) stated that the term *phonological awareness* is "a blanket term" (p. 2) because there are different levels of awareness of phonology. They posited a hierarchical organization of words based on different ways of breaking up a word into smaller units. The most basic division is at the level of *syllable*, followed by a division at the intra structure of each syllable referred to as the *onset* and *rime*. The onset includes the initial consonant(s) whereas the rime is composed of a vowel and the following consonant(s). The last and highest level of phonological awareness is at the

level of *phonemes* where the child is capable of isolating the constituent phonemes of a word

Goswami and Bryant noted that when a child recognizes that two words rhyme, then the child possesses a degree of phonological awareness. Rhymes are a significant part of young children's lives and seem to be specifically related to their development of phonological knowledge and of later reading achievement. In fact, Adams noted that "the roots of phonemic awareness and therefore success in reading can be found in traditional rhymes and word games" (p. 43). Breaking a word into its constituent phonemes is important to the child because these phonemes are represented by alphabetic letters. In the process of reading, the novice readers needs to learn these relationships between letters and phonemes (grapheme-phoneme relationships).

Snider (1995) defined phonemic awareness as the understanding that speech is made of individual sounds. Such understanding is not necessary for learning to speak, but it is necessary for learning to read and spell in an alphabetic language. He differentiated phonemic awareness from a general knowledge of phonics. In general, phonics is using the letter sounds to sound out words while phonemic awareness refers to the conscious understanding that words are made up of phonemes. Snider stressed the importance of phonemic awareness teaching in schools because English, an alphabetic language, necessitates learning to map sounds onto letters. Snider along with Liberman et al. (1989) and Adams (1990) pointed out that teaching phonemic awareness requires explicit instruction and that acquisition of the alphabetic principle helps beginning readers to decode and comprehend efficiently.

Phonetic recoding to maintain information in working memory refers to the transforming of written symbols into a sound-based representational system Phonological coding in working memory requires individuals to briefly retain verbal material (letters, digits, words, decodable nonwords) presented auditorily or visually and then recall this material from short term memory Wagner et al (1994) suggested the following

> Efficient phonological coding in working memory should enable the beginning reader to maintain an accurate representation of the phonemes associated with letters or parts of words as well as to devote the maximum amount of cognitive resources possible to the ongoing decoding processes (p 75)

This type of phonological processing is often referred to as "memory span task " Several research findings indicated that many children with reading disabilities and dyslexic individuals have problems in developing phonological representations and retrieving these representations from memory For example Catts (1989) found that poorly stored phonological memory codes make speech sound codes less accessible for individuals with reading disabilities which in turn slows their speech planning processes Wagner et al (1994) described some tasks for assessing phonological coding in working memory In the first task, *memory for sentences*, children listen to recorded sentences and repeat them verbatim In another task, *digit span-visual presentation* children watch a series of varied number of digits on a computer screen and then recall these numbers

Perfetti (1986) suggested that limitations in working memory have a negative impact on higher language processes For example, some children fail to comprehend a sentence although they manage to decode all the words in it because their cognitive

resources are used to decode all the words in a sentence, leaving insufficient resources for higher language processes such as syntax.

Brady (1991) reviewed a large body of research on the relationship between the verbal working memory and reading. She stated that at the level of underlying language processes, verbal memory problems stand out as the *most characteristic feature* of poor readers. Poor readers usually recall fewer items when given a short list of digits, letters, words, or nonwords. In explaining how the working memory operates, Brady used the analogy of a pie. She suggested that if encoding requires one fourth of the pie, then three-quarters are available for recall. The implication of this process is that the more efficiently one encodes phonological information, the more resources are available for working memory operations.

Vellutino, Pruzek, Steger, and Meshoulam (1973) and Shankweiler, Liberman, Mark, Fowler, and Fischer (1979) found no significant differences between good and poor readers on memory tasks that include non speech stimuli. This finding is noteworthy because it suggests that poor readers do **not** have a general memory impairment. Their working memory seems to be impaired only when tasks involve storing linguistic information.

Phonological recoding in lexical access involves rapid retrieval of phonological codes from a **long-term store**. This has been typically assessed by rapid automatic naming tasks. These tasks require the child to name, as rapidly as possible, a series of 30 to 50 items arranged in rows on a plate (e.g., digits, colors, or letters). The efficiency with which children retrieve phonological codes from long-term memory has been found to

correlate highly with reading achievement (Denckla & Rudel 1976, Felton & Pepper 1995, Wolf 1991)

Rapid Automatized Naming (R.A.N) has been viewed by several authors (Denckla and Rudel, 1976 Felton and Pepper 1995 Wolf 1991) as an important phonological processing ability distinct from phonological awareness and associated with reading ability The R A N task requires individuals to rapidly name a series of symbols presented visually in a random order These symbols can be single letters, numbers, colors, or pictures R A.N (also called speeded naming) requires that individuals visually code the symbols and access the lexical entry for these sequenced stimuli Performance on this task is primarily measured by the length of time needed to name all the presented stimuli, although accuracy is also noted Several authors have shown that poor readers perform poorly (tend to be slower and make more errors) on speeded naming tasks of colors, numbers, and pictured objects (Denckla and Rudel 1976, Lovett, 1987, Wolf Bally, and Morris, 1986, Wolf 1991)

Wolf (1984) hypothesized that a breakdown at specific stages of the naming process will impede children's reading development Naming is a complex process made up of different cognitive and linguistic subprocesses (e.g attention and articulation) These subprocesses are important and necessary for the naming process to occur normally Wolf focused her research on the naming process because of its strong link with reading failure in dyslexia Wolf's model of naming and reading is constructed of four operations perceptual conceptual lexical, and motor Such a model helps in determining the subprocess at which naming errors may have occurred

Wolf (1991) summarized the findings from research on the relationship between naming speed and reading. She stated that this relationship depends on the nature of the tasks and the developmental abilities of the learner. In the earlier developmental stages, all naming-speed tasks predict all later reading abilities. In these early stages of reading when young readers name visual stimuli in a rapid manner, they seem to be using a group of subprocesses that are used in all forms of reading at the second grade. However, later on in development, the underlying cognitive subprocesses for both speeded naming and reading become more differentiated. That is, the subprocesses required for the rapid automatized naming of graphological symbols (i.e., letters) in the later primary grades are different from the subprocesses required for naming colors or common objects. In addition, she stated that by the end of Grade 3, rapid naming of graphological symbols appears to be strongly related to decoding ability.

Wolf suggested that there is a brain mechanism that is common both to language and to motor functions and referred to it as the *temporal processing mechanism*. This brain mechanism could be responsible for rapid rates of activating relevant subprocesses of different tasks.

> If there is a failure in an underlying temporal processing mechanism, then--at a minimum--basic cognitive and linguistic systems will function at a slower rate of processing information, and the rapidity that should develop in particular naming and reading subprocesses will be impeded. (Wolf, 1991, p. 137)

Wolf also suggested that reading failure could be attributed to one of three possible conditions. The first condition might be slower linguistic and motor functions due to an impaired temporal processing mechanism. A second potential condition could be

failure of an underlying temporal processing mechanism along with one or more failures at one of the major subsystems (e.g., working memory, phonology, lexical representation, or comprehension). The last potential condition could be failure at a specific major subsystem.

Earlier, Denckla and Rudel (1976) had compared 10 dyslexic children who suffered from minimal brain dysfunction (MBD) but had normal intelligence to 10 MBD subjects with dyslexia and to 120 normal controls on a picture naming test. The experimental subjects in the three groups were matched on age and sex. The age range of the experimental subjects ranged from 8 years to 11 years. The purpose of their study was to find out the extent to which "linguistic", as opposed to "perceptual", problems correlated with reading failure. Subjects were required to name each object drawn on a card as quickly as possible. Responses were timed with a 1/100 sec stop watch. The MBD subjects with dyslexia performed more slowly and received lower scores on naming pictured objects than both the MBD subjects and the normal controls. The types of errors the subjects with dyslexia exhibited were similar to those of the normal children, suggesting that the dyslexic group's errors were not due to perceptual impairment. Denckla and Rudel related the nature of such errors to the linguistic retrieval process rather than to perceptual deficits (p. 12).

Wolf (1984) studied 115 children first seen in kindergarten and followed through second grade. By the end of second grade, 98 children (43 girls and 55 boys) remained from the original sample. All of the experimental subjects received a battery of naming and reading tests at the end of every school year. Wolf's study focused on three issues.

(1) Developing a battery of naming tests that predict later reading ability, (2) determining the developmental changes in the relationship between continuous naming and reading and (3) determining the ability of different naming tests to differentiate average from severely impaired readers at different stages of reading development

Results of Wolf's longitudinal study revealed that poor readers differ significantly from average readers on all naming tests. In fact, most of the severely impaired readers were unable to complete the rapid alternating stimulus test. In kindergarten, a general relationship was found between naming and reading as all continuous naming tests were highly predictive and related to all reading skills. In first grade, only the stimuli with automatic properties (letters and numbers) correlated strongly with word recognition, a lower-level reading process. However, by second grade continuous naming tasks were not found to correlate with reading comprehension. Wolf hypothesized that comprehension required higher-level subprocesses such as use of context. In addition, Wolf found that tests that emphasize retrieval rate are the best predictors of naming performance and errors. Wolf concluded that tests which incorporate rate of processing (R A N) are essential to evaluate the automatic nature of reading. In fact, she found that the continuous alternating naming test (R A S) are excellent for predicting severe reading impairments. The continuous alternating test requires the child not only to rapidly name stimuli but also to alternate between letters and numbers or letters, numbers, and colors.

In a three-year follow up study, Wolf, Bally, and Morris (1986) studied 83 children. They tested the experimental children for three consecutive years starting from kindergarten (ages 5-6 years) through Grade 2 (ages 7-8 years). The objective of their

research was to determine the relationship between rapid retrieval measures and reading measures at different stages Rapid retrieval was measured for graphological (letters and numbers) and nongraphological (colors and drawings of object) stimuli Reading measures included connected oral reading, single word reading (lower-level processes), and silent comprehension (higher level processes) At the end of Grade 2, Wolf et al classified the children into two groups based on their reading achievement Eleven children were considered severely impaired readers, whereas 72 children were classified as average readers

The results of the Wolf et al study showed that the impaired reading group performed significantly slower than average readers on all tasks across all years In addition, the impaired readers performed poorly on both types (R.A.N and R.A.S)of rapid retrieval measures with the slowest retrieval time for letter naming Strong correlations were found between rapid naming of graphological stimuli and lower-level reading measures The implication of this finding, according to Wolf et al, is that "impaired readers begin with both a general naming deficit and a particular deficit for graphological symbols" (p 995) They also suggested that rapid naming measures should be considered as early powerful predictors of later achievement in all reading tasks

Bowers and Wolf (1993) observed poor fourth grade readers and found that they fell into two categories based on severity of reading difficulty Children with severe reading difficulties had serious deficits in both naming speed and phonemic awareness However children with more moderate reading deficits were impaired in phonological awareness alone Krug and Wolf (1996) attempted to study the diagnostic implications of

the *double-deficit hypothesis* of reading disability. She studied four subgroups of fifth grade readers identified on the basis of phonological awareness and visual naming speed. The four subgroups were the "double-asset" group (strength in phonological awareness skills and naming speed), the "double-deficit" group (deficits in phonological awareness and naming), the "phonological-deficit" group (deficit in phonological awareness skills), and the "rate-deficit" group (deficit in naming speed). All children were given a battery of reading (word recognition and reading comprehension) and cognitive (lower level and higher level abilities) tests. Lower-level processing skills assessed included word naming speed, phoneme awareness, spelling retrieval, spelling recognition, and orthographic coding of words and nonwords. Higher-level processing skills assessed included problem-solving tests such as sequential reasoning and matrix completion. Results of this study supported the *double-deficit hypothesis* and revealed different characteristics for each of the subgroups. The performance of the double-asset group was superior to any other subgroup in the sample on both reading and cognitive measures and showed the strongest phonemic awareness and naming speed skills. In contrast, the double-deficit group performed the most poorly of all on both reading and cognitive measures. Their reading ability was three to four years behind the double-asset group. They showed the weakest phonemic awareness, the weakest orthographic knowledge, and the slowest naming speed in the sample. The single-deficit group performed better than the double-deficit group on most tasks. They had the most difficulty with phonological processing skills as assessed on measures of orthographic ability (e.g., spelling). In general, they were more impaired than the double-asset group and the rate-deficit group. Finally, the rate-deficit readers displayed

slow naming speed, relatively poor spelling skills, and were described as moderately impaired readers (five months below grade level on a word recognition test). Despite their weaknesses, the rate-deficit group seemed to have intact comprehension skills and performed comparably to the double-asset group on two of three problem-solving measures. The findings of this study supported the tenet proposed by Bowers and Wolf (1993)that children with severe reading disabilities have marked deficits in both phonological processing and naming whereas children with moderate reading disability have deficits in phonological awareness alone.

Ackerman and Dykman (1993) compared three different groups of readers: 42 dyslexic children, 56 children with attention deficit disorder (ADD) but without reading disability, and 21 "garden-variety" slow readers. The age of the examined subjects ranged from 7 years, 5 months to 12 years 0 months. The authors tested several hypotheses associated with dyslexic readers. Those most relevant to this discussion are included here. First, there is a relationship between slow articulation and poor reading (Baddeley, 1986). Second, the dyslexic group will perform more slowly on the speech rate and continuous naming rate than the ADD control group. Third, the dyslexic group will perform poorly on the phonological tasks. Fourth, the "garden variety" group will not differ from the ADD group on continuous naming and phonological tasks.

All subjects were examined on a variety of measures: articulation rate (rapid articulation of digits, letters, and words), continuous naming speed (rapid naming of 50 stimuli presented on a card), phonological sensitivity (detecting the word among four that does not sound like the others), serial memory (reciting a series of digits, letters, and

words in exact order), serial running memory/recency (repeating the last three digits heard in tape-recorded lists of digits), and mental addition (selecting the correct sum of three digits presented on computer screen). These measures were selected because recent literature has reported them to be the most common deficits seen in children with specific reading disabilities.

The results of Ackerman and Dykman's study showed that (a) the articulation rate correlated highly with the continuous naming rate and with memory span (serial memory test), (b) continuous naming and phonological sensitivity correlated most highly with reading ability and (C) the "garden-variety" group was not found to be significantly slower than the ADD group on the continuous naming. They were also not different from the ADD group on the oddity test. In fact, the "garden-variety" group was found to be superior to the dyslexic group on the oddity task and the running memory task. Ackerman and Dykman suggested that children in the "garden variety" group, despite their lower IQ were better than dyslexic readers on all of the tasks because they were more advanced readers. Finally, Ackerman and Dykman stated that because phonological sensitivity and continuous naming predict later reading difficulties educators should include more practice in these two literacy-related areas.

McBride-Chang and Manis (1996) studied 51 disabled readers and 74 good readers to determine the relationship between naming speed and reading. Poor readers were identified based on their Word Attack score on the Wide Range Achievement Test (WRAT). Children were considered poor readers if they were at or below the 25th percentile. Good readers, on the other hand, are those who were at or above the 50th

percentile The mean age of the participant children ranged from 8 years, 3 months to 10 years, 5 months The authors examined the associations of multiple measures of speeded naming, phonological awareness, and verbal intelligence with word reading The results showed that the mean scores for poor readers were lower than those for good readers on each measure McBridge Chang and Manis found that the phonological awareness tasks intercorrelated with reading tasks for both groups whereas the speeded naming measures only intercorrelated with reading measures significantly among poor readers No significant correlation was found between naming speed and word reading among good readers The verbal intelligence measures were highly associated with word reading only for good readers However, the same measures were found to be unassociated with reading in poor readers They concluded that performance on speeded naming tasks was significantly related with word reading for poor readers only

In summary deficits in both phonological awareness and rapid naming abilities indicate greater risk for reading failure Weaknesses in speeded naming tasks indicate that the student may have difficulty in learning names of letters and sight words and may have trouble in developing fluent reading. Several authors have suggested that the speed of processing visual symbols correlates with word reading only for poor readers (McBridge-Chang and Manis, 1996 Wolf 1991) The correlations between speeded naming and reading seem to fade as children attain a certain level of fluency in reading and become skilled readers Felton and Pepper (1995) emphasized the importance of including phonological coding in lexical access as part of test batteries that are used during preschool and kindergarten to identify children at risk for reading failure. They

recommended that children who are not proficient in the areas of phonological awareness or rapid naming should receive continued instruction in phonological awareness skills as well as direct instruction in sound symbol associations and sight words.

In the past two decades many researchers have focused on key variables that influence early reading ability. Phonological awareness has emerged as the skill most critically related to reading achievement. Several studies have showed that good readers perform better than poor readers on phonological awareness tasks (Bradly and Bryant 1985, Goswami and Bryant, 1990, Liberman, Shankweiler, and Liberman, 1989 Snider 1995, Torgesen, Wagner, and Rashotte, 1994 Wagner and Torgesen, 1987).

Lewkowicz (1980) reviewed the literature on phonemic awareness training. She categorized the tasks of phonemic awareness for the purpose of finding the tasks that correlate most highly with learning to read. She proposed two categories of tasks for phonemic awareness training, tasks that are useful in the early stages of training (segmentation and blending), and tasks that are useful only to the later stages of training (isolation of medial and final sounds). Lewkowicz concluded that blending and phonemic segmentation correlate highly with reading success. In fact, she recommended that these two tasks be included in reading-readiness programs. She also suggested representing the sounds of words with visible different color stimuli to facilitate understanding the letter-sound relationship in words.

Ball and Blachman (1991) investigated the effect of training phoneme segmentation and instruction to letter names and letter sounds on word recognition and spelling. Their study included 89 kindergarten children whose mean age was 5.71 years

The authors divided their subjects into three treatment groups. (a) Training in segmenting words into phonemes and in letter name-sound correspondences (phoneme awareness group), (b) Training in letter name-sound correspondences alone (language group) and (c) no training (control group). Ball and Blachman found that the kindergarten children who received training in segmenting words into phonemes as well as in letter name correspondences performed significantly better on reading and spelling than children who received training in letter-sound correspondences only and children who received no intervention. Children in the phoneme awareness group were able to generalize trained items to novel ones. In addition, children in the language activities group did not significantly improve their phoneme segmentation skills, reading skills or spelling skills when compared with the control group.

Tangel and Blachman (1992) conducted a study to determine the effects of PA training on invented spelling performance in two groups of kindergartners. The first group (77 children) received intervention in phoneme awareness, whereas the second group (72 children) had no intervention and thus seemed as the control group. The mean age of the children was 5 years and 6 months. Prior to intervention the two groups of children were matched on age, sex, race, phoneme segmentation abilities, letter name and letter sound knowledge and the word identification test scores. The children in the treatment group received training in (1) say-it-and-move-it phoneme activities (2) segmentation-related activities (e.g., sound categorization) and (3) letter name and letter sound activities. The treatment group received the intervention four times per week for 15 to 20 minutes over a period of 11 weeks.

The results showed that the treatment group outperformed the control group on tasks of phoneme segmentation, letter-sound correspondence and phonetic reading of regular words and nonwords Furthermore, the treatment group was significantly better in spelling performance than the control group on every word Tangel and Blachman attributed the outstanding difference in the groups' performance to the combined effects of phoneme awareness and letter-sound correspondence training

Torgesen, Morgan, and Davis (1992) investigated the effects of different types of phonological awareness training programs on the acquisition of reading in kindergarten children. They compared the effectiveness of a program that trained both analysis and blending skills (AB) with the effectiveness of a program that trained synthesis skills only (B) Only the children who received training in both synthesis and blending showed a positive effect for the word learning task

Torgesen et al acknowledged that the analysis and blending group (AB) received one more week of training than the blending group (B) However, they noted that this could not be the reason for better performance on the word reading task by the AB group The extra training time was necessary because the AB group experienced difficulties during the first four weeks of the program. The analytic skills were more difficult to teach than the synthetic skills Therefore, although the AB group had a longer training period, they received less generalized practice in terms of the number of phonemes and words used in the program than the B group Torgesen et al concluded that training should be in both types of phonological tasks (analysis and blending) to achieve better awareness of

the phonological structure of words which in turn leads to improvement in learning to read new words

Brady, Fowler, Stone and Winbury (1986) conducted a longitudinal training study on four kindergarten classes from inner-city schools (N=96). The mean age of the experimental subjects at the beginning of the study was 5.4 years. The experimental group received training in phonological awareness for a period of 18 weeks. The authors designed their training study in three phases. Phase I, *phonological awareness above the level of phoneme*, training took place three times a weeks for 20 minutes over a four week period. The activities involved in this phase were (1) rhyming, (2) segmentation (e.g., syllable deletion), (3) categorization (odd one out), and (4) identification of syllables in different positions. Phase II, *isolating the phoneme*, training took place three times a week for 20 minutes a session over a six week period. The focus in this phase was on the phonemic unit rather than the syllable. Examples of phase II tasks were grouping words on the basis of a shared sound and phoneme deletion (saying a word without a particular sound in it). Phase III, *representing the internal structure of the syllable*, training took place three times a week for 20 minutes over an eight week period. The focus of training in this final phase was on the internal structure of the syllable using a method called "say it and move it" described by Blachman (1987). In this phase, children were trained to segment words into phonemes by the use of visual markers such as tiles which in turn made the tasks more concrete. Post training, these kindergartners showed significant gains in phonological awareness (rhyme), phonemic awareness (segmentation and deletion), and word identification when compared to their control counterparts. Brady et

al confirmed the importance of including phonological awareness in the curriculum of beginning readers

In a longitudinal study, Byrne and Fielding-Barnsley (1995) initially trained preschool children in phonemic awareness and then followed them through grades 1 and 2 Children in the experimental group were compared to a control group The mean age of the experimental group (64 children) in grade one was 7 4 years and the mean age in grade two was 8 4 years Children in the experimental group were trained in phoneme identity for 30 minutes per week for a period of 12 weeks consecutively The control group contained children who depended mainly on sight word reading In their follow up study Byrne and Fielding-Barnsley found in their follow-up study that the experimental group continued to outperform the control group in decoding pseudowords and in reading comprehension They attributed the superior performance of the experimental group on the reading comprehension task to their word identification skills, supported by their superior decoding skills Byrne and Fielding-Barnsley stated that the purest form of measuring decoding is pseudoword identification, especially for beginning readers They also suggested that the preschool training of phoneme identity should proceed gradually from nonwords to regular words to irregular words

Finally, Rivers, Lombardino, and Thompson (1996) conducted a single subject design treatment study of three prereading kindergarten children who received phonemic decoding training (segmenting and blending skills) The single-subject multiple-baseline design across behaviors and subjects allowed the researchers to measure each subject s performance pre- and post-training independently The authors conducted this study in

two phases In the first phase (letter-sound association training), subjects were required to name letters (10 consonants and 3 vowel sounds) and then produce the sounds of each of these letters In the second phase (segmentation and blending training) each subject was taught separately to segment and blends CVC pseudo words Rivers et al found that decoding training had obvious positive effects on the word recognition task when pre-test scores where compared to post test scores All three subjects were able to generalize their decoding skills to untrained CVC pseudo words, CVC real words, CV and VC pseudo-words and CV and VC real words

In summary training phonological awareness skills has a positive impact on later reading achievement Training such skills early in the preschool and kindergarten stages improves decoding skills which in turn leads to better word recognition skills Snider (1995) suggested that teaching of phoneme awareness should progress from easy to hard in the following sequence (1) segmenting sentences into words, (2) segmenting words into syllables, (3) segmenting words into onsets and rimes rather than into separate single phonemes, (4) teaching continuous sounds (fricatives and vowels) before stop sounds-because they can be prolonged (5) proceeding from CV or VC words to CVC words, (6) training blending tasks before segmenting tasks and (7) training phonemic manipulation (making up a new word from another word by taking out a phoneme from it, e g , flat becomes fat if we take out the "l" sound) after phonemic blending and segmenting

Reading Disabilities

Characteristics of Children with Reading Disabilities

There are different types of reading disabilities with different primary signs characteristic of each type. In general, reading is made up of two major skills, decoding and comprehension. Failure at one or both of these skills leads to three different kinds of reading disabilities (Aaron and Joshi, 1992).

The first type of reading disability is referred to as *Specific Reading Disability* (SRD) or developmental dyslexia (DD). Children who are diagnosed with SRD have a decoding deficit, normal listening comprehension skills, and relatively good reading comprehension skills. Children who show the second kind of reading disability Nonspecific Reading Disability (NSRD), usually have adequate word recognition skill but impaired reading comprehension. The third group of children with reading disabilities referred to as Low Ability Readers (LAR) are those who have deficiencies in both comprehension and decoding skills. These children are usually slow learners. The LAR group constitutes the largest proportion of all poor readers.

According to Aaron and Joshi (1992), the incidence of SRD does not exceed 2% of the school population. Children with SRD often have average or above average IQ scores. Their listening comprehension is usually comparable with their IQ. The main deficit of children with SRD is poor decoding and word-recognition skills. Other symptoms of SRD include slow rate of reading, spelling errors, errors in oral reading, and syntactic errors in written language. Children with SRD seem to read much slower than their average peer readers because they struggle with decoding and word recognition. As

they grow older, they tend to overrely on context for word reading Children with SRD perform poorly on reading comprehension tasks only if these tasks are timed However when their reading comprehension is assessed without time restriction, their performance may be normal or close to normal Relatively normal comprehension distinguishes them from individuals with NSRD and LAR, who perform poorly on reading comprehension tests whether these tests are timed or not Another important symptom of SRD is poor spelling Because children with SRD have major deficits in phonological processing skills and serious difficulties in grapheme-phoneme conversion skills, they commit many spelling errors Aaron and Joshi (1992) observed that children with SRD make errors in the proper use of suffixes in their written work and often seem to confuse homophonic words in their spelling Students with SRD tend to overrely on sight word reading rather than decoding Their usual strategy is to read the words based on the first few letters, leading them to make many oral reading errors of substitution and/or omission.

The most prominent feature of NRD is poor comprehension coupled with adequate decoding skills These children can pronounce words and read sentences fluently However their comprehension ability is impaired. According to Aaron and Joshi, the NRD condition exists because decoding is a modular skill independent of comprehension On the other hand, the LAR group exhibits deficits in both decoding and comprehension as well as in other aspects of learning Children who are classified as low ability readers also have limited vocabularies in addition to poor comprehension and decoding skills

Deficits in Phonological Processing in Children with Reading Disabilities

The area of phonological processing is the linguistic domain that has been studied most extensively in children with reading disabilities (Catts, 1989 Pratt and Brady 1988 Shankweiler, Crain, Katz, Fowler, Liberman, Brady Thornton, Lundquist, Dreyer Fletcher, Stuebing, Shaywitz, and Shaywitz, 1995, Vellutino Scanlon, and Spearing, 1995) Pratt and Brady (1988) compared 15 good readers and 15 poor readers in third grade ranging in age from 8-10 years The authors wanted to examine the relationship between phonological awareness and reading skill They hypothesized that phonological awareness skills would correlate with reading ability after three years of reading instruction This study showed that good and poor readers differed significantly on all phonological awareness measures Poor readers exhibited fundamental deficits in phonological awareness tasks and performed worst on tasks that required phoneme manipulation. The authors noted that such tasks place demands on verbal short-term memory, a known area of weakness in poor readers At least 40% of the variance between the good and the poor readers was accounted for by measures of phonemic awareness Pratt and Brady recommend that instruction in phonological awareness be included in reading programs because this skill is essential to understanding the foundation of the English orthography

Shankweiler, Crain, Katz, Fowler Liberman, Brady, Thornton, Lundquist, Dreyer Fletcher, Stuebing, Shaywitz, and Shaywitz (1995) examined 353 children between 7 5 to 9 5 years of age All children included in this study had either a reading disability arithmetic disability, or attention deficit disorder All the subjects were assessed in the

areas of phonological awareness (phoneme deletion and verbal short-term memory) morphological awareness, and syntax. The purpose of this study was to explore whether reading-disabled children display a specific pattern of language abilities that distinguishes them from normal children and children with other types of disabilities. Results revealed that: (1) deficits on phonological tasks were common among the reading-disabled children (2) phoneme deletion and verbal short term memory tasks distinguished reading-disabled from normal children and the other two groups (3) high correlations existed between measures of phonology (phoneme deletion) and morphology (generating the appropriate derived form from the base of words that undergo phonological change) (4) syntax did not distinguish poor from normal readers nor the other two groups, (5) deficits in reading comprehension were related to difficulties in word recognition. Shankweiler et al. noted that the strong association between phonological and morphological measures suggest that the two measures converge on a common ability and that the morphological difficulties of children with RD seem to be "at least in part an expression of a phonological limitation" (p. 154)

Finally, Vellutino, Scanlon, and Spearing (1995) compared 15 poor and 15 normal readers in second and sixth grade, respectively. All subjects were individually administered measures of semantic development and measures of phonological coding ability. The purpose of their study was to evaluate semantic and phonological coding deficits as alternative explanations of reading disability. Results of their study showed that strong and consistent differences on phonological coding tasks (e.g., decoding pseudowords and speeded naming) indicate that reading problems are causally related to

phonological coding deficits rather than semantic deficits particularly at the second grade level In contrast, Vellutino et al found that the semantic coding deficits are likely to be characteristic of poor readers at the sixth grade level, and are likely a consequence of prolonged reading difficulties These researchers suggested that vocabulary deficits are the reason behind the older poor readers low achievement.

In summary phonological coding appears to be the *core deficit* in children with specific reading disability (SRD) It is this phonological coding deficit that is the source of the alphabetic coding difficulties that poor readers encounter (Vellutino et al 1995) and is believed to contribute significantly to the difficulties encountered by these impaired readers on tasks of naming and reading (Brady 1991, Catts, 1989 Kamhi, Catts, and Mauer, 1990, Snowling, 1981 Torgesen, Wagner, and Rashotte, 1994 Wolf, Bally and Morris, 1986, Wolf, 1991)

Comparison of English and Arabic Orthography

The phonological system of Arabic is comprised of 28 consonant sounds three long vowel sounds, and three short vowel sounds. They are represented orthographically by 28 consonant symbols, three long vowel symbols, and three short vowel symbols indicated sometimes by diacritics (Abboud and McCarus, 1992) American English, on the other hand, is made up of 24 consonant sounds and 17 vowel sounds represented orthographically by 20 consonant and five vowel symbols. Arabic orthography differs from English in several ways First Arabic is a Semitic language that is written from right to left while English is derived from an Indo-European origin and written from left to right Arabic does not distinguish between upper case and lower case, as English does

Arabic letters change form depending on their position in the word. Each Arabic letter has different forms depending on whether it is connected to a preceding letter, a following letter, both preceding and following letters or whether it stands in isolation. Therefore each letter looks different depending on its occurrence in the word. English letters have approximately the same shape whether they occur word initially or word finally. However, in English, a letter is written in its capital form (upper case) when it occurs in the beginning of a sentence or when it is a proper name. In Arabic, most of the letters are joined to the letters preceding them or following them. Therefore, the difference between printed and handwritten Arabic is not as great as in English. Further, in Arabic, syllables do not get slurred when they are unstressed; every syllable, long or short, is distinctly pronounced. In this respect, Arabic is like Italian or German, and not like English (Aide & Samoan, 1992). Finally, the Arabic short vowels are not represented orthographically except in Koranic text. The reading of Arabic texts without the short vowels becomes an important part of the student's task because the student has to find out the right way of pronouncing a word without the orthographic representation of its short vowels. An Arabic word that contains short vowels and consonants is written only with the consonants, making the consonant more like a syllable than an individual phoneme. Lack of vowels makes reading confusing to the beginning reader. However, if all short vowels are written (as they are in koranic texts), then every word is pronounced exactly as it is written and written exactly as it is pronounced which makes the Arabic language highly phonetic (Aida & Samoan, 1992).

Generally in first grade Arabic-speaking children are taught all the letters in their three positions all the vowels (long and short) long-vowel syllables single word recognition, and some basic text reading Upon finishing first grade, children are expected to recognize all letters in all word positions the diacritics, and long vowels. They are also expected to syllabify words blend consonants to form a word and read single words and some basic texts.

Common Procedures in Identifying At-Risk Children

There are some common procedures used to assess early reading and prereading skills of English speaking children These procedures have been used formally by researchers and informally by teachers to identify children at risk for reading failure Such procedures include a variety of measures such as letter knowledge (recognition and production), invented spelling, phonemic awareness, and speeded naming These measures have been found by many researchers to be highly predictive of reading disabilities (Adams 1990 Chall 1967, Denckla & Rudel 1976, Goswami & Bryant, 1990, Krug & Wolf 1996 Wagner & Torgesen, 1987, Wolf, 1984 1991) Since no such measures exist in Arabic the intent of this research project was to modify existing procedures found to predict reading disability in English speaking children to use with Arabic-speaking children.

Statement of the Problem

Across the cultures, it is expected that a significant number of children will fail to acquire reading skills at the rate expected for their age and grade It is very important to identify such children as early as possible to ensure early intervention, preferably before

formal reading instruction begins In spite of early identification and preventive education, a number of children continue to exhibit reading difficulties in spite of years of remedial instruction

The proportion of Arabic reading-disabled children is expected to be similar to that documented in English speaking and other cultures Language, speech, reading and/or cognitive impairments/disorders are linguistic and cultural phenomenon In fact many Arabic-speaking students end up dropping out from school due to the pervasive effects of their reading disability on their overall academic performance

For English speaking children, a variety of measures have been developed to identify who are at risk for reading disorders or who have fully manifested disorders of reading. Such measures assess pre-literacy skills, phonological awareness, phonological recoding in lexical access, word identification, reading fluency and reading comprehension These measures have been used extensively in the research on reading disability For many of these measures, normative data are available measures (Denckla & Rudel 1976, Lombardino et al., 1996, Torgesen & Wagner, 1994, & Woodcock, 1987)

Few if any informal tests and no norm-based measures of prereading or reading exist for use with Arabic-speaking children Arabic-speaking children are typically identified as reading disabled two three years after formal reading instruction begins because no formal measures are available to detect Arabic children at risk for reading failure in the early stages of preschool and kindergarten. In this study measures that are most effective in identifying at-risk English speaking children have been modified for use with Arabic-speaking children A battery of procedures was assembled to assess a broad

range of pre-reading, reading-related and early reading skills to use in identifying Arabic speaking children at risk for reading failure. Procedures were chosen because they have been shown to be highly predictive in identifying children at risk for reading failure in other cultures

The following experimental questions were addressed

1. How do Arabic speaking children perform on letter knowledge, invented spelling, word recognition, and concept of word tests adapted from the Early Reading and Screening Instrument (ERSI)?

These tests were used because they have been used formally by researchers and informally by many teachers to assess children's early reading and pre-reading skills and were shown to be predictive of later reading achievement, particulary letter knowledge and invented spelling. (Lombardino et al. 1996)

2. How do Arabic-speaking children perform on the phonological awareness (PA) tasks of sound categorization, rhyming oddity, elision (syllable deletion) and phoneme segmentation?

Phonological awareness deficits are found to be a core deficit in children with reading disabilities (Aaron & Joshi, 1992, & Shankweiler et al 1995) and are highly related to later reading achievement (Goswami & Bryant 1990, Pratt & Brady 1988 Torgesen, Morgan, & Davis 1992, & Wagner & Torgesen 1987) Tasks selected for this study were based on the PA battery adapted from Torgesen and Wagner (1994) This battery is the most comprehensive compilation of tasks available to assess a range of PA skills

3 How do Arabic speaking children perform on naming tasks that assess rapid serial naming and verbal fluency?

Speeded naming has been found as a good predictor of reading failure and a core deficit for a subset of English reading-disabled children (Bowers & Wolf, 1993, Denckla & Rudel 1976 McBride-Chang & Manis 1996 Wolf 1984 1991 & Wolf Bally, & Morris, 1986)

4 How do Arabic-speaking children perform on the speech production task?

Results of various studies showed correlations between difficulty in speech production, sequencing complex words, and poor reading Further reading-disabled subjects' productions of repeated multisyllabic words have been found to be slower and less accurate when compared to children without reading disabilities (Catts, 1989, Kamhi, Cats, and Mauer, 1990, Snowling 1981)

5 How do Arabic-speaking children perform on the visual perceptual task of visual matching of Cyrilic letters (Russian alphabets)?

In the past some reading disabilities were attributed to a primary deficit of visual-perceptual processing (Herman, 1959, Orton, 1925) Therefore, this relationship between perceptual skills and reading is examined in this study (Pratt & Brady, 1988 & Vellutino, Scanlon, & Spearing 1995)

6 Do children from three demographic areas in the West Bank city of Nablus (city, refugee camp, and village) differ?

Obtaining a representative sample of children from three primary demographic areas is important in order to determine if this battery can serve as a valid tool for Arabic-

speaking children from different socioeconomic status (SES) environments It was expected that children from the city setting would perform slightly better than the other two groups because (a) City schools are better equipped with supplies audiovisual equipment, and libraries (b) Inexperienced teachers are typically assigned to village rather than city schools, are paid less, and must serve a two-year probationary period before being moved to better schools or being given a raise in salary (c) Teachers in city schools are more likely to teach only one subject than those in other settings and (d) Village schools often have a shortage of teachers even after the school year has begun.

7 What is the nature of correlative relationships among ERSI, PA, naming, speech production and visual-perceptual tests?

A large body of research, as mentioned above, has shown significant correlations between PA skills and other reading related tasks (Goswami & Bryant, 1990 Pratt & Brady, 1988 Torgesen, Morgan, & Davis, 1992 & Wagner & Torgesen, 1987 For example, invented spelling and word recognition correlated most highly with later word identification and word analysis (Lombardino et al. 1996) Therefore it is of interest to determine if the same relationships exist in the Arabic language

CHAPTER 2
METHODOLOGY

The purpose of this study was to collect a normative database using measures found to correlate highly with later reading achievement Three general skill areas were measured phonological awareness tasks, naming tasks and a complex speech production task along with a task of visual-perception. A variety of tasks were used to conduct measurements in each skill area. This chapter includes information on the subjects, stimuli, examiners, equipment, scoring, analysis and procedures

Subjects

The subjects in this study were 150 Arabic-speaking children. Both parents of each subject spoke Arabic, and Arabic is the primary language spoken at home The study included an equal number of boys and girls between the ages of 7 years, 0 months and 7 years, 6 months. The subjects were tested during the very beginning of their second grade year of school Due to the demographic distribution of Palestine (West Bank), this study included an equal number of subjects from three different types of housing communities in the West Bank city of Nablus city villages, and a United Nations refugee camp (Table 2-1) The examiner tried to include a representative sample from the different locations of SES levels, subjects intellectual aptitude and academic achievements and children at each month of the six month age range Prior to testing any subject, a special permit was

Table 2-1 Numbers and Percentages of the Subject Sample From Each of Three Types of Community

Type of Community	Percentage of the Subject Sample	Number of Subjects
City of Nablus	57.58%	86
Villages	30.00%	40
Camps	12.42%	24

obtained from the Ministry of Education in Ramallah, West Bank, and Human Subjects approval was obtained from the University of Florida (Appendix A).

The subjects were screened for hearing to reduce the possibility of speech or reading difficulty due to hearing impairment. They were screened at 500, 1000, and 2000 HZ at 20 dB bilaterally. Those who failed the hearing screening were excluded from the study. The examiner also excluded any subject who had a history of frank sensory-motor or cognitive deficit (i.e., cerebral palsy, paralysis, microcephaly, oro-facial abnormalities, mental retardation). In addition, the examiner asked the advice of the classroom teacher to find and exclude any child the teacher believed to be abnormal or different in ways that might affect speech, oral language, or reading.

Examiners and Setting

The investigator and an assistant, who was extensively trained by the investigator, administered all test instruments. The assistant, a health care worker, had worked in several health professions such as community rehabilitation and public health awareness

programs In addition, she had attended courses in speech-language pathology She was selected because of her interest in working with children in the field of speech language pathology Testing took place in the city of Nablus and its surrounding villages and camps The investigator visited two primary schools for girls and two primary schools for boys in Nablus, two schools for boys and two schools for girls at two distinct villages, and one school for the boys and one for the girls at a refugee camp

Experimental Stimuli

The subjects were administered an adapted version of the Early Reading Screening Instrument (ERSI), four phonological awareness tasks, three speech production tasks, and one visual perceptual measure All tests were administered to each subject individually Descriptions of each measure follows

The Early Reading Screening Instrument (ERSI)

The Early Reading Screening Instrument--ERSI (Morris, 1992) was adapted to assess Arabic speaking children The stimuli for all subtests were changed to conform with Arabic linguistics and culture In addition, the number of items in some subtests was reduced due to the time constraints of testing a large number of subjects The following ERSI subtests were administered

Letter Knowledge

The purpose of the alphabet knowledge subtest is to measure the subjects' knowledge of letters for identification and production The letters included in this task can be seen in Table 2-2 For the letter identification task, the subjects were asked to identify eight randomly ordered letters, first in their isolated forms and then the same letters in

their medial forms. This procedure was used because Arabic script does not have upper and lower case letters. Instead the Arabic alphabet shapes differ based on the letter's position in the word (i.e., isolated, initial, medial and final). Letters were presented individually on 8 x 11 inch laminated cards. The examiner said to the subject, "Read these letters for me out loud." The examiner noted the subject's method of reading the alphabet (phonics vs. names of the letters). The subject's naming of the letters was scored for accuracy.

Table 2-2 Alphabet Identification Stimuli

Letters in Isolation	Letters in Medial Position	Maximum Points
ب	ـبـ	2
ح	ـحـ	2
ف	ـفـ	2
و	ـو	2
ك	ـكـ	2
ع	ـعـ	2
م	ـمـ	2
س	ـسـ	2

For the letter production task, the subject was given a blank paper and asked to write letters to dictation (Table 2 3) The subject was asked to write only two or three letters on each line to avoid confusion both for the subject and for the examiner when scoring To instruct each child the examiner said, "I am going to say some letters I want you to write each letter as clearly as possible I will say each letter twice " The examiner then dictated the alphabet letters in random order No time limit was set for the recognition or production tasks The number of stimuli for the letter knowledge subtest (recognition in isolation, recognition in medial position, and production) was 24 yielding a possible score of 24 points, eight for each section

Table 2-3 Alphabet Production Stimuli

Letters in Isolation	Maximum Points
ب	1
ح	1
ف	1
و	1
ك	1
ع	1
م	1
س	1

Invented Spelling

The purpose of this subtest was to assess the subject's ability to use their phonemic knowledge to spell eight words from dictation (Table 2-4). First, the examiner asked the subject to spell two trial words and gave the child feedback about the instructions or the correctness of the response. Then, the examiner dictated each of the eight stimulus words one at a time allowing the subject enough time to write each word. The examiner said to the child, "I am going to say some words. I want you to write them as clearly as possible. Remember to connect the letters and add the diacritics where you need to." No time limit was given, however, the subject was encouraged to proceed as efficiently as possible. Once the subject started spelling the words, the examiner did not give feedback.

This subtest was scored word by word based on the invented spelling screening procedure in the ERSI (Morris, 1992). A point was awarded for each phoneme (consonant, vowel, and diacritic) accurately represented in each word. The eight experimental words used in this subtest ranged from four to six phonemes each. A point was deducted if the subject did not connect the phonemes where needed. The maximum score for this subtest was 40.

Word Recognition

The purpose of this subtest was to assess the subject's word reading skills (Table 2-5). The subjects were asked to read two word lists, one for basal words and one for decodable words. Basal words were those that appeared frequently in beginning reader texts and, therefore, were expected to be recognized instantly. Basal words were chosen

Table 2-4 Invented Spelling Stimuli

Stimuli	Maximum Points
Trial: /ba ba/ (daddy)	
Trial: /du r/ (houses)	
/ba b/ (door)	4
/χo χ/ (plums)	4
/qalam/ (pen)	6
/ʔasad/ (lion)	6
/waraq/ (paper)	5
/jamal/ (camel)	6
/ʃams/ (sun)	5
/ti n/ (fig)	4

from the first grade Arabic language book. Decodable words were those that appeared less frequently and were less familiar to first graders, but all were decodable. The examiner said to the subject "Read these words for me out loud. The children then attempted to read the words as the examiner pointed to them. They were not timed while doing this

task. However, they were asked to proceed to the next word if they spent more than 10 seconds.

Table 2-5 Word Reading Stimuli

Basal Words	Decodable Words	Maximum Score
/walad/ (boy)	/til.mi ð/ (pupil)	2
/bint/ (girl)	/maz.ra ʕa/ (farm)	2
/ʔallah/ (God)	/mu han dis/ (engineer)	2
/samak/ (fish)	/mus taʃ fa/ (hospital)	2
/ba.ba/ (daddy)	/na ʔem/ (asleep)	2
/ma ma/ (mommy)	/ʂa lih a t/ (good deeds)	2
/lawh/ (blackboard)	/mus ta ʈi l/ (rectangle)	2
/mawz/ (banana)	/mar ta de la/ (bologna)	2

Concept of Word

The purpose of this subtest was to assess subjects' ability to read and identify target words in three sentences. Each of three 8 x 11 inch line drawings (called ' Sarah

Story") was accompanied by a sentence under the drawing describing the picture (Table 2-6). The subject was asked to describe what was in the picture and was praised for that. Then, the examiner pointed to the printed sentence and told the subject what was in the picture. The examiner then **finger pointed** to the words and read them aloud and then asked the subject to finger point read with the examiner. Finally, the subject finger point read aloud on his/her own. One point was awarded when the subject finger point read the entire sentence correctly. When the subject finished finger point reading, the examiner pointed to two target words and asked the subject to read those target words. One point was awarded for each target word read correctly. Thus, a total of three points were possible for each picture. The same procedure was repeated for two more test pictures. A total score of nine points was possible on this task.

Table 2-6 Concept of Word Stimuli

	Sentence Stimuli
1	Sarah is walking in the rain
2	She sees a big dog
3	The dog shakes water on Sarah

Phonological Awareness Measures

Phonological Awareness (PA) was assessed in four tasks: sound categorization, rhyming oddity, elision, and segmentation into phonemes taken from an experimental

battery of phonological processes defined by Torgesen and Wagner (1994) All the PA subtests in this study were modified to assess Arabic speaking children Testing of these four tasks was discontinued if the subject failed all trial items plus four experimental items

Sound Categorization

The purpose of this subtest was to measure the subject's phonological awareness by identifying the first sound s/he hears in a word read to him/her In this task, the examiner read a set of eight words (Table 2 7) and asked the subject to say the first sound that s/he heard in each word The examiner provided two trial items prior to the eight experimental words The beginning sounds selected here were expected to be articulated correctly by 7-year-olds This developmental consideration was important to eliminate the possibility that a subject might provide the wrong beginning sound due to an articulation error The examiner said, "I am going to say some words I want you to listen carefully and tell me the first sound you hear in each word, what does it begin with." The subject received one point for each correct answer

Rhyming Oddity Task

The purpose of this subtest was to measure the subject's ability to differentiate between onsets and rimes The examiner asked the subject to listen carefully and detect the word that was different from the other two (i e the one that did not rhyme or sound like the other two words) This subtest began with two trial sets of three words followed by eight experimental sets with three words in each set (Table 2-8)

Table 2-7 Sound Categorization Stimuli

Stimuli	Maximum points
Trial /su q/ (market)	
Trial /ra.s/ (head)	
/kursi/ (chair)	1
/baqara/ (cow)	1
/tuf fa ha/ (apple)	1
/malek/ (king)	1
/na ma/ (slept)	1
/samak/ (fish)	1
/fara ʃa/ (butterfly)	1
/ʃadʒara/ (tree)	1

Table 2-8 Rhyming Oddity Stimuli

Stimuli	Maximum Score
Trial /balad/ /walad/ /mahal/ (country, boy, store)	
Trial /baːb/ /nuːr/ /daːr/ (door light, houses)	
/daːr/ /naːr/ /fiːl/ (house fire, elephant)	1
/taːʤ/ /ʕaːʤ/ /tiːn/ (crown, ivory fig)	1
/bard/ /ʤaːʤ/ /ward/ (cold, chick,flowers/roses)	1
/jad/ /raʔs/ /faʔs/ (hand, head, shovel)	1
/lawz/ /naːs/ /mawz/ (almond, people, banana)	1
/tuːt/ /ħuːt/ /batˤ/ (berry whale, duck)	1
/sariːr/ /ħariːr/ /waraq/ (bed silk, paper)	1
/faras/ /ʤaras/ /ʤamal/ (mare, bell, camel)	1

Elision (Syllable Deletion)

The purpose of this subtest was to assess the child's syllable awareness in a task requiring the ability to separate the sounds of a word into syllables. The examiner told the subject that they would be sound playing with some words. First, she said a word and asked the subject to repeat it. Then, the examiner asked the subject to say the same word

but without the first syllable, providing two trial items before the eight experimental words (2-9). One point was awarded for each correct answer allowing for a possible total of 8 points. These words were bisyllabic and trisyllabic Arabic words that resulted in meaningful shorter words after the deletion of the first syllable.

Table 2-9   Elision (Syllable Deletion) Stimuli

Stimulus	Maximum Score
Trial /mana r/--/na r/ (light, fire)	
Trial /maqas/--/qas/ (scissors, to cut)	
Trial /maqfu l/--/fu l/ (closed, beans)	
/hur ra s/ (guards, head)	1
/χul χe l/ (ankle bracelet, uncle)	1
/ki ta b/ (book, repent)	1
/ʔi na s/ (female name, people)	1
/qa dam/ (foot, blood)	1
/sa ʕi d/ (happy, feast)	1
/mas du d/ (locked, worms)	1
/dʒama l/ (beauty, money)	1

Phoneme Segmentation

The purpose of this phonemic awareness subtest was to assess the subject's ability to segment words into their constituent phonemes. This task included four trial items and eight experimental stimuli of varying difficulty (Table 2-10). The first four stimuli were comprised of a CVC syllable and the final four were comprised of a CVCV or a CVCVC structure. The examiner instructed the subject to sound out all the sounds he/she hears in a word. In the trial items, the examiner modeled the desired response by saying the word and pronouncing all its phonemes separately.

Table 2-10 Phoneme Segmentation Stimuli

Stimulus	Maximum Score
Trial /ba b/ (door)	
Trial /ʕu d/ (late)	
Trial /ti n/ (figs)	
Trial /ma dʒi / (past)	
/ra s/ (head)	1
/zi r/ (large clay pot used for water)	1
/du d/ (worm)	1
/fa r/ (mouse)	1
/dʒa ri/ (my neighbor)	1
/qa dʒi / (judge)	1
/ka nu n/ (barbecue grill)	1
/mi za n/ (scale)	1

Complex Speech Production Measure

Rapid production of multisyllabic words was assessed. The purpose of this subtest was to assess the subject's ability to rapidly produce speech in multisyllabic words. The examiners said words and asked the subject to repeat each word three times as quickly as s/he can. The examiners praised the subject for his/her productions regardless of the accuracy of the production.

The examiner said to the subject, "I am going to say a word. I want you to repeat it three times as quickly as you can." These words (Table 2-11) were selected deliberately because they were multisyllabic words and posed some difficulty in production. The examiner began with three trial items. The subject's responses were audio-taped, and the type of phonological error was recorded for later analysis. Repetitions were scored for their accuracy. Each three correct repetitions of a word was awarded one point, yielding a total of 8 possible points.

Naming

Oral Word Association Test (Verbal Fluency)

This subtest was used to assess the subject's ability to rapidly access items to a named category. The examiner asked the subject to name as many foods as s/he could in 60 seconds. The examiners reminded the subject to read and name as quickly as s/he can when speed was measured. The subject was reminded that this task was timed and instructed to name as quickly as possible. The examiner began timing when the subject named the first item. The examiner began with a trial item about naming "things to wear."

The score was based on the number of correctly named items in 60 seconds. Also, number of errors were recorded (Geddes & Crockett, 1975). Any repeated item was disregarded.

Table 2-11 Multisyllabic Word Stimuli

Stimulus	Maximum Score
Trial /mar ta.de.la/ (bologna)	
Trial /mas ṭa.ra/ (ruler)	
Trial /mar ʤe ħa/ (swing)	
/sul.ħu.fa./ (turtle)	1
/ʃu ku la ta/ (chocolate)	1
/ʔaχ ṭa bu ṭ/ (octopus)	1
/mus taʃ fa/ (hospital)	1
/miʃ miʃ/ (apricot)	1
/mar wa.ħa/ (fan)	1
/kuʃ tu ba n/ (thimble)	1
/muʃ mis/ (sunny)	1

Rapid Serial Naming

This subtest was used to measure the subject's ability to rapidly name a series of pictures The subject was presented with a plate that had pictures ordered serially into five rows of 10 items The examiner instructed the subject to name all the pictures in order The examiner also told the subject to name items as quickly as possible because this subtest was timed A stop watch was used to measure the subject's speed on this naming task The total number of the pictures presented on the plate were 50 allowing a total possible score of 50 points The score was based on the amount of time in seconds the subject took to name all 50 items The number of errors was also recorded

Visual-Perceptual Measure

The purpose of this subtest was to measure the subject's ability to match unfamiliar shapes The examiner showed the subject a card on which letters of the Cyrillic (Russian) alphabets were printed (Table 2-12) The subject was asked to match the Russian letter in the margin with the one that looked exactly like it in the line next to it, choosing among four Russian letters The Russian letters were chosen because they were not expected to be familiar to Arabic speakers This type of matching required only visual discrimination skills Verbal learning or memory storage for shapes was not required to do this task

Procedure

After the screening was completed and subjects were selected the examiners tested each subject individually in a room at the school The examiner tape recorded one task, repetition of multisyllabic words The approximate length of testing ranged from 12 to 35 minutes per subject depending upon the subject's cooperativeness and speed of

response In administering the tasks the examiners followed the order presented in the description of the test instrument above The examiners gave clear instructions about each task and provided trial items for the subject where indicated above

Table 2-12 Visual-Perceptual Stimuli

Stimulus	Choices	Maximum Points
Ц	Г Ш Ц Л	1
П	Ц Н Щ П	1
Б	З В Р Б	1
Я	Ч К Б Я	1
Ч	Л д Ч Б	1
М	П Ш М м	1
О	Ю О С З	1
И	Ц У И Л	1

<u>Scoring</u>

Scores were calculated for each of the tests administered and their subtests Table 2-13 summarizes the maximum possible scores for each of the administered tests and its corresponding subtests Each subject received a total score of the entire test in addition to

a score for each individual subtest Each subject had a separate scoring sheet (Appendix B)

Analysis

Scores for all subjects were determined on each of the ERSI test and its subtests the PA subtests the oral-language subtests, and the visual perceptual matching task. Means standard deviations and ranges were calculated for each test and each subtest a) entire ERSI, b) all ERSI subtests, c) all PA subtests d) speech production, and e) visual perceptual task Data were compared across three groups of different SES/communities (cities, villages, and camps) Data were also compared between females' and males' performance on all tests

Table 2-13 Summary Table of Assessment Measures

Early Reading and Screening Instrument Subtests (ERSI)	Subtests	Maximum Score
Alphabet knowledge	Recognition of letter isolation	8
	Recognition of letters in medial	8
	Production of letters	8
Invented spelling		40
Word recognition	Basal	8
	Decodable	8
Concept of word		9
Total ERSI		89
Phonological Awareness tasks (PA)		
Sound categorisation		8
Rhyming oddity		8
Syllable deletion		8
Phoneme segmentation		8
Total PA		32
Speech production tasks		
Multisyllabic word repetition		8
Oral word association		# of items correct &
Rapid serial naming		amount of time & # of items correct
Visual-perceptual task		8

CHAPTER 3
RESULTS

The primary purpose of this study is to collect a normative database on the performance of Arabic-speaking children from different communities in West Bank The subjects in this study were examined on several reading and reading related measures that were shown to be significantly related to later reading achievement For all comparative measures across community groups and gender, Analyses of Variance (ANOVA) were performed at 05 level of significance Significant differences between the groups for community and gender were derived by running the Sheffe test with a significance level of 05 Pearson correlation coefficients were calculated to examine relationship among reading and reading-related variables The P-value was set at significance level of 0 001

Statistical Analysis

ERSI Data

The ERSI test covers a broad range of subtests that were shown to be highly predictive of later reading ability (Morris, 1992) The ERSI is also known for its high predictive validity of later reading achievement (Lombardino et al , 1996)

The mean total ERSI raw score for the 150 subjects tested was 63 46 out of a possible maximum score of 89 (71 3%) with a standard deviation of 23 55 The highest and lowest scores for the ERSI test were 89 and 9 respectively Means and standard

deviations were derived for all the subjects on the basis of gender (Table 3-1) and basis of community (Table 3-2) A possible maximum score of eight was calculated for the alphabet knowledge and word recognition tests The possible maximum score on the spelling and the concept of word tests was 40 and 9 respectively Considering all the subjects' performance on all ERSI subtests, the highest score the subjects achieved was on the concept of word subtest (mean score= 7 57) and the lowest was on the decodable word recognition subtest (mean score=2.81)

No significant difference was found between male and female subjects' score on the total ERSI (F=2 44 p=0 12) Female subjects had a mean total ERSI score of 66 62 (74 48%) with a standard deviation of 20 83 Male subjects had a mean total ERSI score of 60 26 (67 7%) with a standard deviation of 25 54 However, a significant difference was found between the performance of subjects from the city and those from the village (F=4 07, p=0 019) Total ERSI mean scores were lower for the village population (mean=54 4) when compared to the city population (mean=66 8)

Phonological Awareness Data

Phonological Awareness (PA) was assessed in sound categorization, rhyming oddity, elision, and phoneme segmentation task The mean total score for the 150 subjects tested was 23 31 out of a possible maximum of 32 (72 26%) with a standard deviation of 7 6 The highest and lowest scores for the total PA tests were 32 and 0 respectively Means and standard deviations were derived for all the subjects on the basis of gender (Table 3-3) and community (Table 3-4) A possible maximum score of eight was

Table 3-1 Means and Standard Deviations for ERSI Scores for Subjects by Gender and for All Subjects Combined

Subject	Alpha. Iso	Alpha Med	Prod	Spell	Basal	Dec	Concept of Word	Total ERSI
Males	6.93 (1.72)	6.25 (2.38)	6.73 (1.93)	24.68 (14.67)	5.53 (2.33)	2.74 (3.23)	7.40 (1.82)	60.28 25.54
Females	7.27 (1.18)	6.79 (1.65)	7.40 (1.20)	28.72 (12.77)	5.83 (2.15)	2.88 (2.89)	7.73 (1.45)	66.62 20.83
All Subjects	7.10 (1.49)	6.52 (2.07)	7.07 (1.64)	26.71 (13.92)	5.68 (2.25)	2.81 (3.06)	7.57 (1.65)	63.46 23.55

Table 3-2 Means and Standard Deviations for ERSI Scores by Community

Subject	Alpha Iso	Alpha Med	Prod	Spell	Basal	Dec.	Concept of Word	Total ERSI
City	7.40 (1.11)	6.79 (1.77)	7.40 (1.14)	28.75 (12.47)	6.09 (1.88)	2.99 (3.01)	7.70 (1.31)	67.12* 20.47
Camp	7.25 (1.45)	6.88 (1.88)	7.08 (1.61)	27.25 (14.62)	6.04 (2.21)	3.79 (3.19)	7.38 (1.78)	65.67 24.48
Village	6.38 (1.91)	5.73 (2.52)	6.35 (2.23)	21.95 (15.16)	4.58 (2.59)	1.85 (2.83)	7.40 (2.13)	54.24* 26.63

* $p \leq .05$

calculated for each of the PA subtests. Considering all the subjects' performance on the phonological awareness tasks, the highest score the subjects achieved was for sound categorization (mean score= 7.06) and the lowest score was for phoneme segmentation (mean score=3.88).

No significant difference was found between male and female subjects' scores on the total PA score ($F=1.01$, $p=0.31$). Female subjects had a mean total PA score of 24.07 (75.2%) with a standard deviation of 6.88. Male subjects had a mean total PA score of 22.62 (70.6%) with a standard deviation of 8.3. However, a significant difference was found between the performance of children from the city and children from the village ($F=5.11$, $p=0.007$). Total PA mean scores were significantly lower for the village population (mean=20.49) when compared to the city population (mean=24.87).

Table 3-3 Means and Standard Deviations for PA Scores for Subjects by Gender and All Subjects Combined

SUBJECTS	Categorization	Oddity	Elision	Segmentation	Total PA
Males	6.67 (2.11)	6.59 (1.91)	5.65 (2.42)	3.71 (3.27)	22.62 8.3
Females	7.45 (1.34)	6.47 (1.80)	6.04 (2.25)	4.11 (3.12)	24.07 6.88
All Subjects	7.06 (1.81)	6.53 (1.85)	5.84 (2.35)	3.88 (3.20)	23.31 7.6

Table 3-4 Means and Standard Deviations for PA Scores by Community

SUBJECTS	Categorization	Oddity	Elision	Segmentation	Total PA
City	7 52 (1 05)	7 07 (1 12)	6 29 (2 07)	4 14 (3 08)	25 02* 5 98
Camp	6.21 (2 60)	5 96 (2 24)	5 04 (2 72)	4 88 (3 32)	22 09 9 82
Village	6 58 (2 18)	5 70 (2 38)	5 38 (2 45)	2 83 (3 11)	20 49* 8 22

* $p \leq 05$

Speech Production Data

The mean score for the Speech Production test for the 150 subjects tested was 6 98 with a standard deviation of 1 24 out of possible maximum score of eight The highest and lowest scores for this test were 8 and 1 respectively Means and standard deviations were calculated for all the subjects on the basis of gender (**Table 3-5**) and community (**Table 3-6**)

No significant difference was found between male and female subjects' scores for the Speech Production test (F=0 02, p=0 863) Female subjects had a mean score of 7 09 with a standard deviation of 1 11 Male subjects had a mean score of 6 86 with a standard deviation of 1 34 Similarly no significant differences were found between the subjects from the city, camp or village (F=1 91, p=0 151)

Table 3-5 Means and Standard Deviations for Speech Production Scores for All Subjects by Gender and All Subjects Combined

SUBJECTS	SPEECH PRODUCTION
Males	6 86 (1 34)
Females	7 09 (1 11)
All Subjects	6 98 (1 24)

Table 3-6 Means and Standard Deviations for Speech Production Scores for Subjects by Community

SUBJECTS	SPEECH PRODUCTION
City	6 88 (1 21)
Camp	6 79 (1 15)
Village	7 30 (1 27)

Naming Data

The scores for the rapid serial naming test were normalized and converted to percentage scores Separate naming scores were calculated a total naming score (combine serial naming and verbal fluency) and separate scores for serial naming and verbal fluency The mean total Naming score for the 150 subjects tested was 69 59 with a standard deviation of 15 15 out of maximum score of hundred The highest and lowest

total Naming scores were 94 1 and 31 4 respectively The mean score for the rapid serial naming test was 74 76 with standard deviation of 19 90 whereas the mean score for the verbal fluency was 62 96 with a standard deviation of 16 62 Means and standard deviations were derived for all the subjects on the basis of gender (Table 3-7) and community (Table 3-8) As seen in Tables 3-7 and 3-8, the naming tests have two sets of scores, converted scores and scores in seconds Considering all the subjects performance on the rapid serial naming, the highest score the subjects achieved was 100 (39 seconds) and the lowest score was 10 (>130 seconds) As for the verbal fluency test, the highest score was 100 and the lowest score was 17 65

No significant differences were found between male and female subjects' scores on the total Naming (F=0 32, p=0 571) Female subjects had a mean total Naming score of 67 55 with a standard deviation of 16 26 Male subjects had a mean total Naming score of 69 63 with a standard deviation of 15 32 Similarly no significant differences were noted between the performance of subjects from the city, camp or village (F=2 61, p=0 076)

Visual Perception Data

The mean score for Visual Perception test for the 150 subjects tested was 7 63 with a standard deviation of 0 91 out of possible maximum score of eight The highest and lowest scores for the Visual Perception test were 8 and 1 respectively Means and standard deviations were derived for all the subjects on the basis of gender (Table 3-9) community (Table 3-10)

Table 3-7 Means and Standard Deviations for Naming Scores for All Subjects Combined and for Subjects by Gender

SUBJECT	RAPID SERIAL NAMING		VERBAL FLUENCY		TOTAL NAMING
Males	75 23 (15 17)	80 Sec (20 Sec)	63 92 (15 47)	10 87 (2 63)	69 63 (15 32)
Females	74 29 (20 76)	81 Sec (23 Sec)	62 03 (17 64)	10 55 (3 00)	67 55 (16 26)
All Subjects	74 76 (19 90)	81 Sec (20 Sec)	62 98 (16 62)	10 71 (2 83)	68 59 (15 15)

Table 3-8 Means and Standard Deviations for Naming Scores for Subjects by Community

SUBJECTS	RAPID SERIAL NAMING		VERBAL FLUENCY		NAMING
City	70 63 (16 55)	76 Sec (20 Sec)	68 47 (15.27)	11 6 (2 6)	69 55 (15 91)
Camp	92 88 (10 60)	68 Sec (18 Sec)	53 68 (12 28)	9 1 (2 1)	73 28 (11 44)
Village	72 75 (12 23)	92 Sec (19 Sec)	56 76 (16 97)	9 6 (2 9)	64 76 (14 60)

No significant difference was found between male and female subjects' scores on the Visual Perception test (F=1 25, p=0 264) Female subjects had a mean Visual Perception score of 7 63 with a standard deviation of 0 98 Male subjects had a mean score of 7 62 with a standard deviation of 0 83 Similarly no significant differences were found between the performance of subjects from the city, camp or village (F=2 96 p=0 054)

Table 3-9 Means and Standard Deviations for Visual Perception Scores for All Subjects by Gender and All Subjects Combined

SUBJECTS	VISUAL PERCEPTION
Males	7 62 (0 83)
Females	7 63 (0 98)
All Subjects	7 63 (0 91)

Table 3-10 Means and Standard Deviations for Visual Perception Scores for Subjects by Community

SUBJECTS	VISUAL PERCEPTION
City	7 78 (0 58)
Camp	7 38 (0 99)
Village	7 45 (1 28)

Correlational Measures

Pearson correlation coefficients were calculated to determine the strength of the relationship between the following variables (a) PA subtests and select ERSI subtests, (b) total scores for the five major areas (ERSI, PA, Speech Production, Naming and Visual-Perception), (c) individual Naming tests and ERSI subtests, (d) Naming and PA subtests (e)Naming and Speech Production, and (f) Visual-Perception and ERSI, PA, Speech and Naming. The P-value was set conservatively at 0.001 due to the large number of variables.

PA Subtest and ERSI Subtests

Correlation coefficients were calculated between scores on the Segmentation, Elision, Sound Categorization and Rhyming Oddity phonological awareness subtests and on the Concept of Word, Spelling and Basal and Decodable Word Recognition subtests of the ERSI (Table 3-11).

Strong correlation were found between phoneme segmentation and decodable word recognition ($r=0.83$, $p<0.001$), phoneme segmentation and basal word recognition ($R=0.80$, $p<0.001$) phoneme segmentation and spelling ($r=0.79$, $p<0.001$) and elision and spelling ($r=0.71$, $p<0.001$). Several moderate correlations were found between PA tasks and ERSI subtest scores.

ERSI, PA, Speech Production, Naming and Visual Perception

Correlation coefficients were calculated between scores from the five main tests: total ERSI, total PA, total Naming, Speech Production and Visual Perception (Table 3-12). A strong significant correlation was found between children's total ERSI and total PA scores ($r=0.87$, $p<0.001$). Moderate correlations were found between total ERS1 and

Table 3-11 Correlations Among PA Subtests and ERSI Subtests.

	Isolation	Medial	Concept of Word	Spelling	Basal	Decodable
Segmentation	0.62*	0.65*	.56*	.79*	.80*	.83*
Elision	0.60*	0.64*	.56*	.71*	.68*	.57*
Sound Categorization	0.59*	0.58*	.55*	.63*	.58*	.40*
Rhyming Oddity	0.56*	0.59*	.46*	.55*	.49*	.41*

*$p \leq 0.001$

total Naming scores ($r=0.51$, $p<0.001$), PA scores and speech production scores ($r=0.45$, $p<0.001$) and PA scores and total naming scores ($r=0.49$, $p<0.001$). Moderate to weak correlations were found between total ERSI scores and visual scores ($r=0.34$, $p<0.001$), total ERSI scores and speech production ($r=0.41$, $p<0.001$) and PA scores and visual-perception ($r=0.37$, $p<0.001$). No significant correlations were found between speech production and total naming ($r=0.17$, $p>0.001$), speech production and visual perception ($r=0.22$, $p>0.001$), and total naming scores and visual-perception ($r=0.26$, $p>0.001$).

Rapid Serial Naming and Verbal Fluency with ERSI Subtests

Moderate significant correlations (ranging from 0.33 to 0.50) were found between the scores of all ERSI subtest and the two tests of Naming (Table 3-13).

Table 3-12 Correlations Among Total Test Scores.

	ERSI	PA	SPEECH PRODUCTION	NAMING	VISUAL PERCEPTION
ERSI	1	87*	41*	51*	34*
PA		1	45*	49*	37*
Speech Production			1	17	22
Naming				1	26
Visual Perception					1

* $p \leq 0.001$

Table 3-13 Correlations Between Rapid Serial Naming and Verbal Fluency and ERSI

	Iso	Med	Prod	Spl	Bas	Dec	Con
Rapid Serial	0.46*	0.38*	0.36*	0.42*	0.42*	0.42*	0.38*
Verbal Fluency (Con)	0.38*	0.36*	0.38*	0.37*	0.42*	0.35*	0.33*

*$p \leq 0.001$

Correlations Between the Rapid Serial Naming and Verbal Fluency Tests and PA Tasks

Most PA tasks correlated significantly with the rapid serial naming and verbal fluency tests (Table 3-14). However, no significant correlation was found between the sound categorization subtest and the rapid serial naming test ($r=0.19$, $p > 0.001$). Weak to moderate significant correlations were found between the rapid serial naming test and

the rhyming oddity ($r=0.30$, $p<0.001$), elision ($r=0.36$, $p<0.001$), and segmentation tests ($r=0.44$, $p<0.001$). Low to moderate significant correlations were found between the verbal fluency test and sound categorization ($r=0.28$, $p<0.001$), rhyming oddity ($r=0.41$, $p<0.001$), elision ($r=0.38$, $p<0.001$), and phoneme segmentation tests ($r=0.40$, $p<0.001$).

Table 3-14 Correlations Between Rapid Serial Naming and Verbal Fluency Tests and PA Tasks

	Cat	Odd	Eli	Seg
Rapid Serial	0.19	0.30*	0.36*	0.44*
Verbal Fluency (Con)	0.28*	0.41*	0.38*	0.40*

*$p \leq 0.001$

<u>Correlation Between Rapid Serial Naming and Verbal Fluency Tests and Speech Production</u>

A significant low moderate correlation was found only between the verbal fluency test and speech production test ($r=0.35$, $p<0.001$). No significant correlation was found between the rapid serial and speech production tests ($r=0.16$, $p>.001$) (Table 3-15).

Table 3-15 Correlations Between Rapid Serial Naming and Verbal Fluency Tests and Speech Production

	Speech Production
Rapid Serial	0.16
Verbal Fluency (Con)	0.35*

* $p \leq 0.001$

Correlation Between Visual-Perception Scores and ERSI, PA and Naming Tests

Low-moderate significant correlations were found between the visual perception scores and ERSI and PA scores, ($r=0.34$, $p<0.001$ for ERSI and $r=0.37$, $p<0.001$ for PA). No significant correlations were found between visual-perception scores and speech production ($r=0.22$, $p>0.001$), verbal fluency ($r=0.25$, $p>0.001$), or rapid serial naming ($r=0.19$, $p>0.001$) (Table 3-16).

Table 3-16 Correlations Between Visual-Perception and ERSI, PA, Speech Production, and Naming

	ERSI	PA	Speech	Rapid	Conf
Visual	0.34*	0.37*	0.22	0.19	0.25

*$p \leq 0.001$

Comparison of Subjects' Performance

On the total ERSI test, 22% of the subjects' scores were one standard deviation below the mean score (Figure 3-1) and 18% were one standard deviation above the mean score (Figure 3-2). In other words, 60% of all ERSI scores lie between the mean and plus/minus one-standard deviation. Moreover, 3% of the children's scores on the total ERSI were two standard deviations below the mean score (Figure 3-3). In other words, 97% of the scores lie between the mean and plus/minus two-standard deviation. On the phonological awareness (PA) test, 16% of the subjects' scores were one standard deviation below the mean score (Figure 3-1) and 21% of the scores were one standard deviation above the mean score (Figure 3-2). This implies that about 63% of the children scored between 15.71 and 30.91 on the PA test when using one-standard deviation

Similarly, when using two-standard deviations about 95% of the children scored between 8.11 and 38.51 (Figure 3-3). In other words about 5% scored either below 8.11 or above 38.51. On the naming test 17% of the subjects' scores were one standard deviation below the mean score (Figure 3-1), while 15% of the scores were one standard deviation above the mean score (Figure 3-2). This implies that about 68% of the children scored between 53.44 and 83.74 on the naming test. Similarly, when using two-standard deviations, about 94% of the children scored between 38.29 and 98.89. In other words, about 4% of all the subjects scored either below 38.29 or above 98.89 (Figure 3-3). On the speech production test, 14% of the subjects' scores were one standard deviation below the mean score (Figure 3-1). This implies that about 86% of the children scored between one standard deviation above/below the mean. Similarly, when using two-standard deviations, about 96% of the children scored between 38.29 and 98.89 (Figure 3-3). On the visual-perception test, 7% of the subjects' scores were one standard deviation below the mean score, and 4% of the children's scores were two standard deviations below the mean score (Figure 3-3). This implies that about 93% of the children scored using one standard deviation above/below the mean and 96% of the children scores using two standard deviation. The distribution of scores for the total ERSI is plotted in Figure 3-4. The distribution of scores for the PA is plotted in Figure 3-5, while the distribution of scores for the naming is plotted in Figure 3-6. The scores were divided into intervals of 5 for the total ERSI, PA and naming tests as shown in Figure 3-4, Figure 3-5 and Figure 3-6.

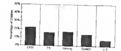

Figure 3-1 Percentage of Subjects Who Scored 1-Standard Deviation Below the Mean

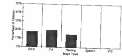

Figure 3-2 Percentage of Subjects Who Scored 1-Standard Deviation Above the Mean

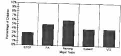

Figure 3-3 Percentage of Subjects Who Scored 2-Standard Deviation Below the Mean.

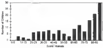

Figure 3-4 Distribution of ERSI Scores

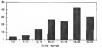

Figure 3-5 Distribution of PA Scores

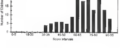

Figure 3-6 Distribution of Naming Scores

Summary of Results

Results of this study reveal that among all the ERSI subtests, the easiest subtest for all the subjects was the concept of word (mean score= 7 57), whereas the most difficult subtest was the decodable word recognition subtest (mean score=2 21)

The easiest among all the phonological awareness tasks was the sound categorization task (mean score= 6 67) In contrast all the subjects encountered most difficulty with the phoneme segmentation subtest (mean score=3 71) The mean average score for the speech production test for all subjects was 6 98 The mean average score for all the subjects on the rapid serial naming test was 74 76, and 62 98 on the verbal fluency All subjects (males and females) performed well on the visual-perception with an average of 7 63

No significant differences were found between male and female subjects' scores on the total ERSI Female subjects had a mean total ERSI score of 66 62 (74 48%) Male subjects had a mean total ERSI score of 60 26 (67 7%) However, significant differences were found between the performance of subjects from the city and those from the village Total ERSI mean scores were lower for the village population (mean=54 4) when compared to the city population (mean=66 8) at $p \geq 05$ No significant differences were found between male and female subjects' scores on the total Phonological Awareness tasks Female subjects had a mean total PA score of 24 07 (75 2%) Male subjects had a mean total PA score of 22 62 (70 6%) However significant differences were found between the performance of subjects from the city and those from the village Total PA

mean scores were significantly lower for the village population (mean=20.49) when compared to the city population (mean=24.87) at $p \geq .05$

The most robust correlation was found between the total ERSI scores and the PA scores ($r=0.87$, $p<0.001$). Moderate significant correlations were found between the PA test and the speech production, and between the PA tests and naming tests. On the other hand, no significant correlations were found between the speech production test and the naming or the visual perception tests. Moreover, there was no significant correlation between the naming test and the visual perception test.

On the total ERSI test, 60% of all children's scores lie between the mean and plus/minus one-standard deviation. In addition, 97% of the children's scores on the total ERSI were two-standard deviations from the mean score. On the PA test, 63% of the children scored between 15.71 and 30.91, since 15.71 and 30.91 are the numbers that are one standard deviation below and above the mean of 23.31. Similarly, when using two-standard deviations, about 95% of the children scored between 8.11 and 38.51. On the naming test, 68% of the children scored between 53.44 and 83.74 when using one-standard deviation, since 53.44 and 83.74 are the numbers that are one standard deviation below and above the mean of 68.59. Similarly, when using two-standard deviations, about 94% of the children scored between 38.29 and 98.89. In other words, about 4% scored either below 38.29 or above 98.89. On the speech production test, 14% of the subjects' scores were one standard deviation below the mean score. This implies that about 86% of the children scored between one standard deviation above/below the mean. Similarly, when using two-standard deviations, about 96% of the children scored between 38.29 and

98 89 On the visual-perception test, 7% of the subjects' scores were one standard deviation below the mean score, and 4% of the children's scores were two standard deviations below the mean score This implies that about 93% of the children scored within one standard deviation of the mean and 96% of the children scored within two standard deviations of the mean

CHAPTER 4
DISCUSSION

The purpose of this study was to collect a regional normative database on a pool of 150 first semester second grade children from city, village, and camp schools in West Bank. Measures used in this study were chosen because they have been found to be highly predictive in identifying children at risk for reading failure. Three general areas were measured: phonological awareness, naming, and complex speech production. This is an important normative study because a large number of children were tested on a broad range of tests including alphabet knowledge, invented spelling, word recognition, naming tasks, and a variety of phonological awareness tasks. These data should be useful in identifying Arabic-speaking children at risk for reading failure across different community settings.

Early Reading Screening Instrument (ERSI)

The ERSI assesses children's ability in a number of tasks confirmed in literature to be important for beginning reading. In this study, children's performance on the ERSI test reveals that subjects (males and females) across the three community groups (city, village and refugee camp) exhibited their highest score on the concept of word subtest and lowest score on the decodable word recognition subtest.

The concept of word subtest requires children to recognize the shape of a whole word in print. This finding supports Snider's (1995) suggestion regarding the teaching of phonemic awareness in a hierarchical manner by beginning with segmenting sentences into words before segmenting words into syllables. It appears that by the time Arabic-speaking children enter second grade, they have developed complete awareness of word boundaries in a sentence. Of all EKSI subtests, children seemed to enjoy performing the concept of word subtest the most. Many children, particularly those whose performance was in the lower third of the group, believed that they were reading when asked to finger-point and repeat what the examiner had read.

The subjects' next highest performance was in the area of letter knowledge particularly in the identification of letters in isolation. This finding is consistent with other research with English-speaking children showing that many children learn to name most alphabet letters before entering kindergarten (Adams, 1990). Because children are first exposed to Arabic letters in isolation, it is not surprising that the performance of this population of children on letter knowledge in isolation was better than letter knowledge in other positions.

Although an item by item analysis was not performed, the subjects' errors were noticed to be consistent in that whenever they misidentified a letter in the alphabet identification subtest, they typically misrepresented the same letter in the letter production subtest. This pattern was observed to occur across the three community groups.

Invented spelling, beyond the most rudimentary levels, requires some awareness of the phoneme segmentation and blending. On this subtest, all subjects averaged 67%

correct when their spellings of simple words were judged for phoneme awareness Children from the village community exhibited the lowest score with an average score of 55% This group's low scores on the invented spelling are consistent with their depressed scores (35%) on the phonemic segmentation subtest of phonological awareness.

Nearly all the subjects attempted to spell the eight stimulus words. The subjects' spellings followed very clear developmental patterns Only a few of the subjects scribbled forms which did not resemble letters at all The majority of the tested subjects detected the first and last consonants but skipped the vowels or spelled out only the first syllable in a word The most advanced spellers recognized all the phonemes (consonants long vowels, and short vowels)

On the invented spelling subtest, all subjects were instructed explicitly with examples and reminded repeatedly to add the short vowels (diacritics) to each spelled word. This was done because in the Arabic orthography it is permissible to write a word without representing the short vowels (diacritics) The short vowels were scored because the examiner wanted to distinguish between children who knew their diacritics and those who did not, as all children are taught the diacritics by the end of first grade This distinction was important for scoring purposes because some children added long vowels in the place of short vowels

The subjects were the least accurate on the ERSI word recognition subtest All subjects performed significantly better on basal word recognition (70%) than on the decodable word recognition (35%) The marked discrepancy between these scores appears related to the fact that the basal words occur more frequently to beginning

readers' texts. A small number of children, mainly those who were ranked in upper third by their teachers, were able to read all of the decodable words. On the decodable word recognition subtest, some children were able to pronounce the first letter or first syllable of the word, but failed to recognize the remaining letters. Children who were unable to read most of the words did not attempt to decode the words, instead, they quickly guessed at the word's pronunciation.

The 150 children tested for this study performed similarly on most of the ERSI subtests when compared to 112 first graders tested by Morris (1992). The children Morris tested averaged 22.5 (56%) on the total ERSI, 8.6 (86%) on the Alphabet Knowledge subtest, 6.7 (67%) on the Concept of Word subtest, 5 (50%) on the Invented Spelling subtest, and 2.2 (22%) on the Word Recognition subtest. Children in this study averaged 63% on the total ERSI, 86.2% on the Alphabet Knowledge subtest, 94% on the Concept of Word subtest, 67% on the Invented Spelling subtest, and 64% on the Word Recognition subtest. Since Morris's children were beginning first graders, it was expected that their scores would be depressed compared to the second grade children tested in this study.

As mentioned in the results, no significant differences were found in the performance of male and female children on the total ERSI. However, significant differences were found between the performance of subjects from the city and those from the village. Total ERSI mean scores were lower for the village population (mean=54.4) when compared to the city population (mean=66.8).

On the total ERSI test, 22% of the subjects' scores were one-standard deviation below the mean score, while 18% were one-standard deviation above the mean score. In other words, 60% of all ERSI scores lie within one-standard deviation. According to the Empirical Rule of statistics (Agresti & Finaly, 1986) these measures are approximately bell-shaped. Moreover, 3% of the children's scores on the total ERSI were two-standard deviations below the mean score and 0% of the children were two-standard deviations above the mean score. This is another indication that the ERSI data can be represented by the bell-shape distribution since 97% of the scores lie within two-standard deviations of the mean. It should be emphasized that the percentages associated with the interval about the mean, are approximates and refer only to distributions that are approximately bell-shaped.

Phonological Awareness (PA)

In this study, phonological awareness (PA) was assessed by administering a broad range of tasks including sound categorization, rhyming oddity, elision and phoneme segmentation. All PA scores were based on a maximum score of 8. Children's highest PA score was on the sound categorization subtest (7.06), while the phoneme segmentation subtest had the lowest mean score (3.88).

The sound categorization subtest requires children to identify the initial sound (onset) in a given word. This finding conforms with the hierarchical organization of phonological awareness acquisition suggested by Goswami and Bryant (1990). Goswami and Bryant noted that words in English can be divided into syllables, onset and rime, and

phonemes. Results of this study indicate that all subjects (beginning second graders) averaged 88% correct on the sound categorization subtest.

On the rhyming oddity subtest, the subjects were required to identify the odd word that did not rhyme with the other two words. The subjects mean score for this subtest was 6.53. Because there were three words presented, chance level was 33.3% correct. Although, the children, on average, performed significantly above chance level (81.6%) many of them were confused by the directions given for this task. Some children attempted to choose a pair that rhymed rather than the odd one that did not rhyme. For a number of children, the directions had to be repeated at least once. Both examiners in this study agreed that the rhyming oddity subtest was more demanding, less concrete and seemed more complicated than the ERSI subtests for most subjects.

On the elision subtest, the subjects were required to delete the first syllable in a word. All words in this subtest resulted in meaningful shorter words after the deletion of the first syllable. The elision subtest requires awareness at the syllable level which is the first level in the hierarchical organization of phonological awareness of words suggested by Goswami and Bryant (1990). The examiners trained each subject by holding his/her hand and tapping on a table the number of syllables in each of the four trial items. The subjects' mean score for this subtest was 5.84 out of a possible maximum of 8.

The phoneme segmentation subtest requires children to break a word into its constituent phonemes. Results of this study revealed that the children exhibited their lowest scores on the phoneme segmentation subtest (mean score of 3.88). On this subtest, children from the village community performed most poorly with an average score of 2.83,

while the city group performed most accurately with an average score of 4.14. The village subjects' low scores on phoneme segmentation are consistent with their depressed scores (55%) on the inverted spelling subtest of ERSI. The analytical skill required for phoneme segmentation requires sound manipulation at the phonemic level, the highest level in the hierarchical arrangement of phonological awareness tasks described by Goswami and Bryant (1990). Only 48% of all subjects were able to perform this task.

No significant differences were found between male and female subjects' total PA score. However significant differences were found between the performance of subjects from the city and those from the village. Total PA mean scores were significantly lower for the village population (mean=20.49) when compared to the city population (mean=24.87).

The significant differences found between the subjects' performance on the total ERSI and PA tests might be due to one or a combination of the following factors: (a) The city schools are better equipped with supplies, audiovisual equipment, and libraries, (b) Inexperienced teachers are typically assigned to villages rather than to the city, are paid less, and must serve a two-year probationary period before being moved to better schools or being given a raise in salary, (c) Teachers in the city schools are more likely to teach only one subject than those in other settings. (d) The village schools often have a shortage of teachers even after the school year has begun, and (e) A few, if any, of the children from the village attend kindergartens.

The distribution of scores on the phonological awareness (PA) test scores is approximately bell shaped about the mean (mean=23.31, standard deviation=7.6).

63 33% of the children scored within one standard deviation of the mean and 95% of the children scored within two standard deviations of the mean

Speech Production

The speech production test required the subjects to rapidly repeat multisyllabic words three times This test was designed to assess the subjects ability to rapidly produce complex phonological sequences. Research has shown that the speech production errors of reading-disabled children are limited to the production of complex phonological sequences such as multisyllabic words (Catts, 1989 Kamhi, Catts and Mauer 1990, Snowling, 1981) The mean score for all the subjects tested on this test was 6 98 out of a possible maximum of 8 Although a formal analysis of errors was not conducted, the examiners noticed that the phonological errors on this test were mainly of the assimilation and metathesis types An example of assimilation is (kuʃtuba n ---> kuʃkuba n) in which the /t/ sound became a /k/ because of the influence of a nearby sound (/k/)in the word An example of metathesis (the reversal of sounds) is (/ʔaχtabu ţ/ ---> /ʔaχbatu ţ/) in which the /b/ and /t/ are reversed

No significant differences were found between male and female subjects' scores for the Speech Production test Female subjects had a mean score of 7 09 with a standard deviation of 1 11 Male subjects had a mean score of 6 86 with a standard deviation of 1 34 In addition, no significant differences were found among the subjects from the city camp or village

Naming

The subjects' naming skill was assessed by administering two naming measures, rapid serial naming of pictured objects and verbal fluency. As discussed earlier, research has found that naming skills are highly correlated with reading ability (Denckla & Rudel, 1976; Wolf, 1984, 1991; Bowers & Wolf 1993, McBride-Chang & Manis, 1996). On both naming tasks, subjects were reminded that they were being timed and that they needed to perform these tasks as quickly as possible. All subjects understood both tasks and attempted to name the items as quickly as they could. However the examiners noticed that some children, especially those who performed poorly on the spelling, phoneme segmentation, and reading, exhibited difficulty retrieving lexical items from memory particularly on the rapid serial naming test.

The rapid serial naming test required children to rapidly name a series of 50 pictured items presented on a plate. This task places demands on retrieving from memory the correct lexical item. The children's score was based on the amount of time in seconds they took to name all 50 items. Then the scores for this test were normalized and converted to percentage scores. The shortest time that took a subject to name this test was 39 seconds, while the longest time was 129 seconds. The mean score for all the subjects tested on this test was 81 seconds (74.76%).

The verbal fluency test required the subjects to name as many food items as possible in 60 seconds. A point was awarded for each edible item the subject named. Repetitions or names of drinks were disregarded. The maximum number of food items named was 17, while the least number of named items was 3. The scores for the verbal

fluency test were normalized and converted to percentage scores The mean number of food items named per minute was 11 (63%)

No significant differences were found between male and female subjects' scores on the total Naming test Similarly, no significant differences were noted between the performance of subjects from the city, camp or village

The distribution of scores on the naming test is approximately bell-shaped about the mean (mean=68 59, standard deviation=15 15) 67% of the children scored within one deviation of the mean and 94% of the children scored within two standard deviations of the mean.

Visual-Perception

The visual-perception test required children to a match Cyrillic symbol (Russian alphabets) with the one that looked exactly like it while choosing among four Russian letters These symbols were chosen because they are unfamiliar to the Arabic speakers This test places demand only on visual discrimination, no verbal learning is involved in this task The reason for administering this test is because, in the past, it was believed that children's difficulty in learning to read was related to primary deficits in visual perception (Herman, 1959; Orton, 1925) This perspective resulted from the common observation that poor readers often reversed the order of the letters Recent research of reading deficits has not supported this theory For example, Holmes and Peper (1977) found that good readers make the same number of reversal errors as poor readers Furthermore Liberman et al (1971) found that reversal errors among delayed second grade readers accounted for less than 25% of all errors Adams (1990) also reported that significant

relationships between children's visual skills and their reading performance has not been found. Results of this study revealed that the mean score for all the subjects tested on the visual perception test was 7.63 out of a possible maximum score of 8. In general, children found this to be an easy task.

No significant differences were found between male and female subjects' scores on the Visual Perception test. Similarly, no significant differences were found in the performance of subjects among the three different community groups.

Correlational Measures

Correlation coefficients were calculated between scores from the five main tests ERSI, PA, Speech Production, Naming and Visual Perception. Strong significant correlations were found between children's scores on the total ERSI and their scores on the PA tests. Moderate correlation was found between ERSI and naming scores, ERSI and visual-perception scores, and ERSI and speech production scores. Weak significant correlations were found between the PA and speech production scores, PA and naming scores, and PA and visual-perception scores. No significant correlations were found between speech production and naming scores, speech production and visual-perception scores, or naming and visual-perception scores.

Correlation coefficients were calculated between scores on the phonological awareness subtests (Segmentation, Elision, Sound Categorization and Rhyming Oddity phonological awareness) and on two ERSI subtests (Spelling and Word Recognition). Moderate to strong correlations were observed between the PA subtests and some of the ERSI subtests. Strong positive correlations were found between the PA phoneme

segmentation subtest and the ERSI decodable word recognition subtest and between the PA phoneme segmentation and the ERSI basal word recognition subtest. A moderate correlation was found between the PA sound categorization subtest and the ERSI decodable word recognition subtest. Furthermore, a moderate correlation was found between the PA elision subtest and the ERSI spelling subtest. Several longitudinal and training studies have shown a strong link between PA and reading and spelling (Ball & Blachman, 1991; Bradley & Bryant, 1985; Brady et al., 1986; Lombardino et al. 1996; Wallach & Wallach, 1976). Further, Torgesen et al. (1994) found a highly significant correlation (.82) between phonological analysis skills and reading in both kindergarten and first grade children. In fact, the authors stated that analytic awareness has a significant causal influence on word-reading skill.

Moderate significant correlations were found between the scores of all ERSI subtests and tests of Naming. All phonological awareness subtests correlated moderately with the total naming and the verbal fluency tests. However, no significant correlation was found between the sound categorization subtest and the rapid serial naming test. Weak to moderate significant correlations were found between the rapid serial naming and the rhyming oddity, rapid serial naming test and elision, and rapid serial naming and phoneme segmentation.

Correlations between naming tests and all ERSI subtests in this study conforms with previous findings by some researchers. For example, Denckla and Rudel (1976) and Wolf (1984, 1991) noted that slowness on rapid naming tasks interfered with the

development of automatized word recognition. In addition, Felton and Wood (1989) found that serial naming was strongly related to reading.

A significant correlation was found only between the verbal fluency test and the speech production test. No significant correlations were found between the rapid serial naming test and the speech production test or total naming scores and speech production scores. Weak significant correlations were found between the visual-perception scores and ERSI and PA scores. No significant correlations were found between visual-perception scores and speech, visual-perception and verbal fluency (Confrontation naming), and visual-perception and rapid serial naming.

Distribution of Subject Population Based on ERSI and PA

Children who score below one standard deviation are considered to be at risk for reading failure and are judged to require immediate remediation. Twenty-two percent of the children performed approximately one standard deviation below the mean on the ERSI test, and 16% of the children performed approximately one standard deviation below the mean on the PA tasks. On the ERSI, 13 (15%) of the children from the city, 5 (21%) of the children from the camp and 15 (37%) from the village scored one standard deviation below the mean. On the PA tasks, 7 (8%) of the children from the city, 7(29%) of the children from the camp, and 10 (25%) of the children from the village scored one standard deviation below the mean.

Limitation and Strengths

The literacy level of the parents was not determined This information might have been useful for determining the effects of parents' educational level on their children's performance In addition, there is no information on how many of the selected subjects had been enrolled in kindergarten A short questionnaire should have been given to each teacher to obtain this information These data could have provided more insight into why differences were found among groups

The sample of subjects selected for this study comes from a city in the northern region, two of its surrounding villages, and one of the refugee camps in the region of the West Bank. In order for the data to be more representative of the entire region of West Bank, more subjects could have been selected from another city in the south.

The speech production test could have been made to be more difficult by increasing the number of repetitions to six instead of three, or counting the number of repetitions the subject makes in a minute (Catts, 1989) Another limitation of this study is that the subjects' age (age range of 7-7 6) However, it should be noted that the aim of this study was to measure the knowledge of the subjects by the time they finish with first grade Children were tested at the beginning of second grade as opposed to end of first grade because (a) many kindergarten children are not taught the alphabets, (b) Many villages do not have kindergartens, therefore, many children from the villages do not go to kindergartens, and (c) the age range of kindergarten children varies widely from three years to nearly six years of age

Finally, it should be emphasized that the advantage of this study is that it examines the same 150 subjects using a broad range of measures that cover several reading-related skills. Other studies done in the area of reading assessment have either examined a lesser number of subjects or a larger number of subjects with fewer measures.

Future Research

The most immediate future research need is to test the same children longitudinally in grades three through six to determine the differential predictive strengths of measures used in this battery. Research of this nature should allow for streamlining this battery so that it can be used efficiently with a high degree of predictive value. Further research is needed to compare the children who performed one standard deviation below the mean with those who performed two standard deviations below the mean. Differences and characteristics of these two groups should be described.

APPENDIX A
PARENTAL INFORMED CONSENT FORM

Note This form will be written in Arabic

My name is Sana T Mohd and I am a doctoral student in the Department of Communication Processes and Disorders at the University of Florida As part of my doctoral research I need to gather information on 150 Arabic children's performance on certain tasks that have been found to be predictive of later reading achievement in English studies. I will need to administer some reading and writing tests Also, I plan to give the children tasks that I have developed that examine sound and letter awareness I would like to test children from the second grade class and I am requesting your permission for your child's participation.

The study will involve reading single words and simple sentences and writing to dictation single words In addition, your child will be requested to do some rhyming tasks I, principal investigator, and another health worker will be administering the procedure The entire procedure will take approximately 50 minutes We will take your child out of the classroom during those periods that are most convenient for your child and his/her teacher Also, the teachers will be providing information about the general standing of your child Participation or non participation of your child in this study will not affect your child's grade in any class or status in his/her program Testing will take place in a quiet room in your child's school

If your child does not wish to participate in the tasks at any time, he or she will be returned to the classroom immediately. Also, you can withdraw your permission at any time. No compensation will be given for participation in this project. No risks of any kind are anticipated.

We will use initials in place of your child's name to protect his/her privacy. The data that we collect on your child will be used as part of group data and your child's individual data will not be identified in reports or publications. The parents will be notified through the teachers of any potential problems uncovered through this research.

Your child will be audiotaped for the purpose of accurate scoring. No one will have access to the tapes except the principal investigator who will erase everything after scoring has been completed. Any questions or concerns about your child's rights can be directed to the UFIRB office, PO Box 112250, University of Florida, Gainesville, FL 32611-2250.

Sincerely yours,

Sana T. Mohd, M.A. Speech-Language Pathologist Doctoral Candidate at the Department of and Communication Processes and Disorders	Linda J. Lombardino, Ph.D. Professor and Supervisor Dept. of Communication Processes and Disorders

I have read the procedure described above. I voluntarily agree to allow my child ___, to participate in Miss Sana Mohd's research study, and I have received a copy of this description

Parent Signature Date

2nd Parent Signature/Witness Date

CHILD'S ASSENT SCRIPT

Hello (child's name) my name is Sana Mohd and I am a doctoral student at the University of Florida, and I am here to do some work with words and letters with you would like to work with me for a while? Good, let's get started I think that these activities will be fun for you Tell me if you get tired and you can stop at any time Are you ready?

APPENDIX B
SUMMARY SCORE SHEET

Name ____________
School ____________
Location ____________

I The ERSI

A. Letter knowledge

1 Alphabet Recognition

a. letters in isolation

No correct

b letters in medial position

No correct

2 Alphabet Production

No correct

B Invented Spelling

No correct

C Word Recognition

1 Basal Words

No correct

2 Decodable Words

No correct

D Concept of Word

1 Finger point reading

No correct

2 Target word reading

No correct

II Phonological Awareness

A. Sound Categorization

No correct

B Rhyming Oddity Task

No correct

C Elision (syllable deletion)

No correct

D Segmentation into syllables

No correct

III Oral-language measures

- A. Multisyllabic word repetition
  No. correct
- B. Naming
  1. Producing names on confrontation
     No. correct per 60 sec
  2. Rapid serial naming
     No. of errors
     Amount of time

IV Visual-perceptual Measure

- A. Russian alphabet matching
  No. correct

SUMMARY OF SCREENING SCORES ON THE ERSI

LETTER KNOWLEDGE

ISO	MED	PROD	TOTAL
8	8	8	24
—	—	—	

INVENTED SPELLING

	TOTAL
33	33

WORD RECOGNITION

Basal	Decodable	TOTAL
8	8	16

CONCEPT OF WORD

Point	Word	TOTAL
3	6	9

SOUND CATEGORIZATION SCORING SHEET

Trial Items

	+/-
kalb	___
shacar	___
fa.r	___

Experimental Stimuli

	+/-
kursı	___
baqara	___
tuffaha	___
malek	___
na ma	___
samak	___
fara sha	___
shadzara	___

Total correct ___/8

RHYMING ODDITY SCORING SHEET

Trial Items

			+/-
balad	walad	mahal	___
ba.b	nu r	du r	___
calam	qalam	bu q	___

Experimental Stimuli

			+/-
da r	na r	fi l	___
ta.j	ca j	tı n	___
bard	su s	ward	___
yad	ra?s	fa?s	___
lawz	na s	mawz	___
tu t	hu t	bat	___
faras	jaras	jamal	___
sarı r	harı r	waraq	___

Total correct ___/8

SYLLABLE DELETION SCORING SHEET

Trial Items

	+/-
ma.na r	____
ja ma l	____
Experimental Stimuli	
hur ras	____
kul xa l	____
kı ta b	____
ka bı r	____
ʔı na s	____
qa.dam	____
sa.cı d	____
mas du d	____
Total correct	____/8

SEGMENTATION INTO SYLLABLE SCORING SHEET

Trial Items

	+/-
ʔar nab	____
mar wa.ha	____
ʔabyad	____

Experimental Stimuli

	+/-
sha ja.ra	____
wa ra.qa	____
xa ru f	____
muf ta h	____
mad ra sa	____
shı ta ?	____
sal la	____
ʔax.dar	____
Total correct	____/8

MULTISYLLABIC WORD repetition SCORING SHEET

Trial Items

	+/-
sha.ja ra	____
mas ta ra	____
mar ta.de fla	____

Experimental Stimuli

	+/-
sul bu fa	____
shu ku la. ta	____
kush tu ba n	____
?ax ta.bu t	____
mus tash fa	____
mush mush	____
mar wa ha	____
mush.mis	____

Total correct ____/8

FLUENCY NAMING SCORING SHEET

FOODS

______	______
______	______
______	______
______	______
______	______
______	______
______	______
______	______
______	______
______	______
______	______
______	______

Total correct ______

RAPID SERIAL NAMING SCORING SHEET

Total correct _____ /50

VISUAL PERCEPTUAL MATCHING SCORING SHEET

Stimulus	Score +/-

Total correct _____ /8

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate in scope and quality as a dissertation for the degree of Doctor of Philosophy

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